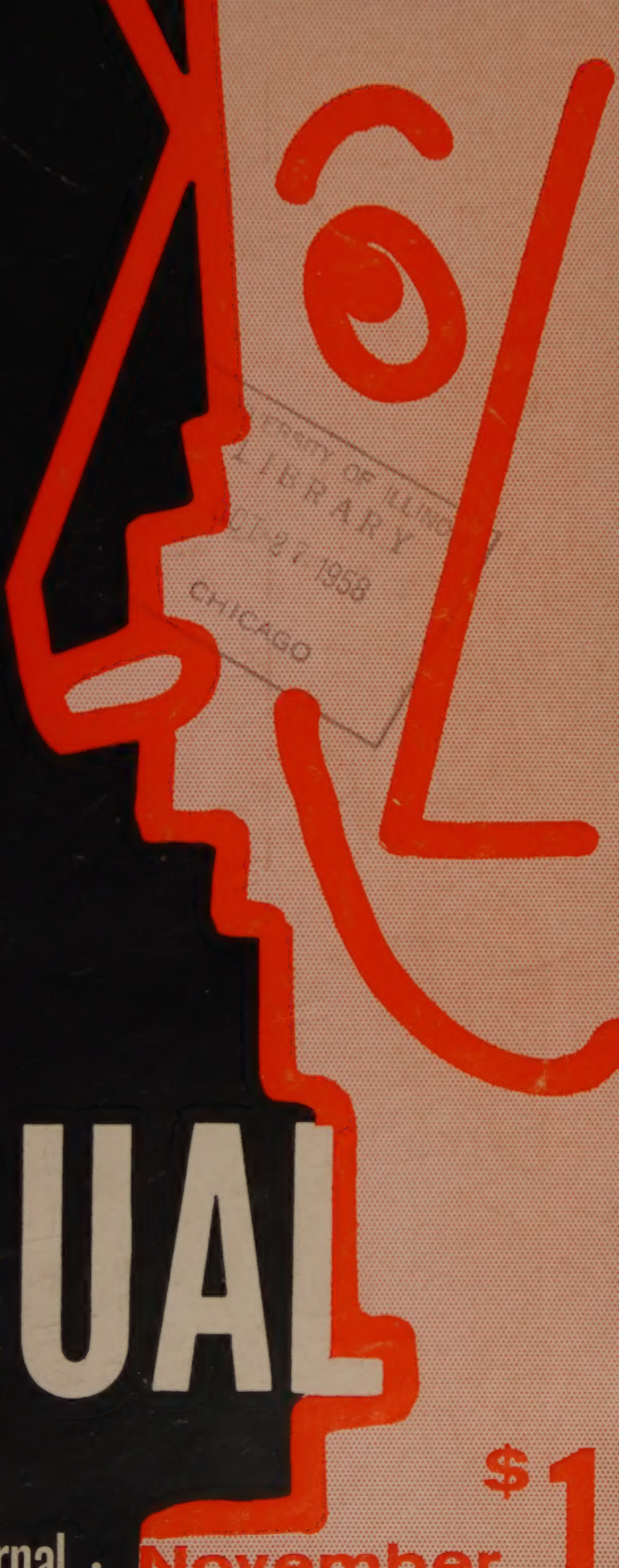
CQ

1958 ANNUAL



radio amateurs' journal · November $1

HERE'S FACT—NOT THEORY

why the "Pacemaker-Thunderbolt" team is your best HIGH POWER LINEAR BU

The "Pacemaker-Thunderbolt" power team will deliver:

1. *More power output* to a wider range of antenna systems than *any other exciter and high power linear amplifier combination!*
2. . . . and it will deliver this power-packed signal at *less dollars per watt than any other exciter and high power linear amplifier combination!*

Provides superb performance and many unique operating and engineering features!

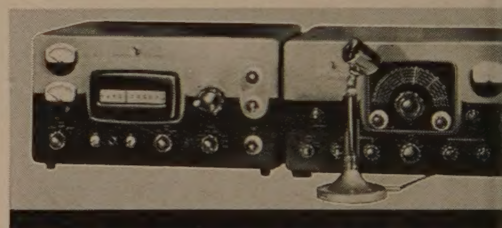
VIKING "PACEMAKER" TRANSMITTER/EXCITER
An outstanding power bargain when used as a transmitter or exciter! 90 watts SSB P.E.P. and CW input . . . 35 watts AM. Unique circuitry uses only 1 mixer for improved spurious signal rejection greater than 50 db. Balanced range audio. Highly stable built-in VFO gives complete coverage of bands without crystal switching or re-tuning. Instant bandswitching 80, 40, 20, 15 and 10 meters. VOX and anti-trip circuits. Wide range pi-network output. Effectively TVI suppressed. With tubes and crystals.
Cat. No. 240-301-2. . Wired. . . . . **Amateur Net $495.00**

VIKING "THUNDERBOLT" AMPLIFIER
Rated at 2000 watts P.E.P. input SSB; 1000 watts CW; 800 watts AM linear! Continuous coverage 3.5 to 30 mcs. —instant bandswitching. May be driven by the Viking "Ranger", "Pacemaker" or other unit of comparable output. Drive requirements: approx. 10 watts Class AB_2 linear, 20 watts Class C continuous wave. Employs two 4-400A tetrodes in parallel, bridge neutralized—wide range pi-network output. With tubes.

Cat. No. **Amateur Net**
240-353-1. . Kit. **$524.50**
240-353-2. . Wired. **$589.50**

Unit	Power input in watts		Cost in dollars per watt	
	SSB † (P.E.P.)	CW	SSB (P.E.P.)	CW
Viking "Pacemaker-Thunderbolt"	2000	1000	$.54	$1.08
Brand "I"	1000	1000	2.09	2.09
Brand "II"	2000*	1000	.74	1.47
Brand "III"	1250	1000	1.23	1.54

*Manufacturer does not publish rating; however, 2000 watts P.E. input represents maximum legal limit under average operati conditions.



For the strongest signal on the band!

Unequalled 100% broadcast-type high level amplitude modulation! Full 2000 watts SSB input—1000 watts CW and AM!

VIKING "KILOWATT"
Brilliantly designed, and engineered specifically high power operation, the Viking "Kilowatt" is *only* power amplifier available which will delive signal with the authority of maximum legal powe all modes!

Class C final amplifier operation provides p circuit efficiencies in excess of 70%. Final ampli utilizes two 4-400A tetrodes in parallel, bridge neut ized — wide range pi-network output. Continu coverage 3.5 to 30 megacycles.

For unsurpassed enjoyment with every contact unforgettable experience . . . step up to the very fi . . . the thrilling Viking "Kilowatt"!
Cat. No. 240-1000. . .
Wired and tested with tubes **Amateur Net**. **$1595**

Matching accessory desk top, back and three dra pedestal.
Cat. No. 251-101-1. . . . . **FOB Corry, Pa. $132**

†The F.C.C. permits a maximum of one kilowatt average power input for the amatuer service. In SSB operation under no conditions this results in peak envelope power inputs of 2000 watts or more depending upon individual voice characteris

For easy terms see your Johnson Distributor

E. F. Johnson Company
2940 SECOND AVENUE S. W. • WASECA, MINNESOTA

For further information, check number 1 on page 194.

Q—The Radio Amateur's Journal

0 West 43rd Street, New York 36, N. Y.

November, 1958
vol. 14 no. 11

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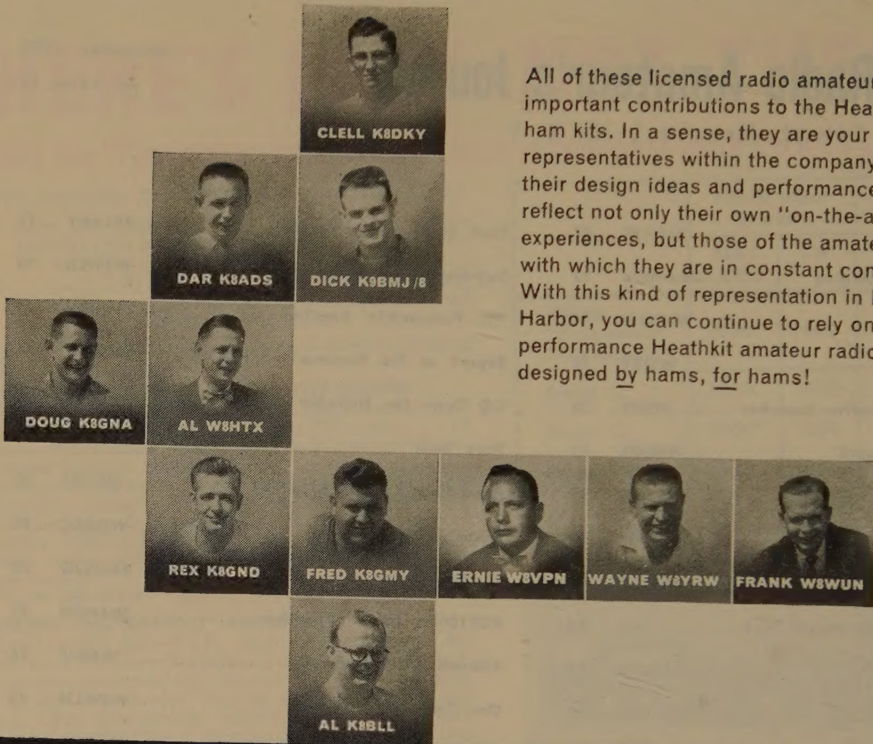
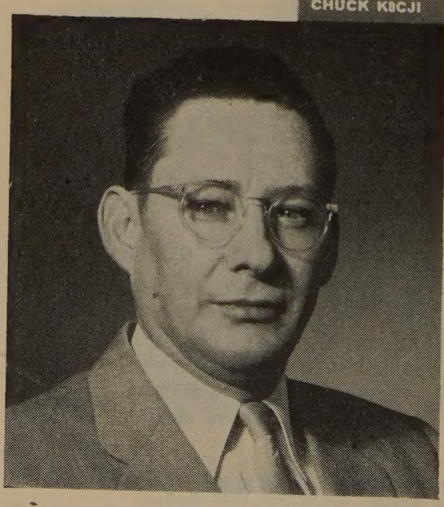


All of these licensed radio amateurs make important contributions to the Heath line of fine ham kits. In a sense, they are your personal representatives within the company, because their design ideas and performance preferences reflect not only their own "on-the-air" experiences, but those of the amateur fraternity with which they are in constant contact. With this kind of representation in Benton Harbor, you can continue to rely on high-performance Heathkit amateur radio equipment designed by hams, for hams!

HEATH *hams work to bring you*



ROGER MACE (W8MWZ)
SENIOR HAM ENGINEER
HEATH COMPANY

HEATHKIT 50-WATT CW TRANSMITTER KIT

MODEL DX-20

$35.95

If high efficiency at low cost in a CW transmitter interests y you should be using a DX-20! It employs a single 6DQ6A t in the final Amplifier stage for plate power input of 50 watts. oscillator stage is a 6CL6, and the rectifier is a 5U4GB. Sin knob band-switching is featured to cover 80, 40, 20, 15, 11 a 10 meters, and a pi network output circuit matches anter impedances between 50 and 1000 ohms to reduce harmo output. Designed for the novice as well as the advanced cl CW operator. The transmitter is actually fun to build, even fo beginner, with complete step-by-step instructions and picto diagrams. All the parts are top-quality and well rated for th application. "Potted" transformers, copper-plated chassis, a ceramic switch insulation are typical. Mechanical and electri construction is such that TVI problems are minimized. If y desire a good clean CW signal, this is the transmitter for yo Shpg. Wt. 19 lbs.

. . . de W2NSD

never say die

Two things worry me about ham radio. They worry me not just because I can see them happening, but because I see them happening and don't know what to do about it. Though they have all been brought up many times before, it struck me that by making an issue of them I might stir up some discussion and ideas which would result in some positive suggestions which might serve to stem the tide.

(1) We don't build any more. The number of hams who build any of their own gear is dwindling into one over infinity squared. And don't you try to count kit assembling as building either . . . it isn't and you know it. As our ranks of home constructors thin we also fall to a lower technical level as a group. In this our own growth is annihilating us by providing a large enough market for our commercial exploitation. It just isn't economically sound to buy anything but commercial equipment any more.

In CQ I try to counter this trend as much as possible by publishing construction articles and surplus conversions. Surplus conversions are one way to get your soldering iron into some radio equipment without worrying about what your modifications will do to the resale value. But obviously the trend has not changed and some better plan must be devised if we are to mend our ways. Perhaps you can solve the problem? Perhaps there is something that can be offered, promised, threatened, etc., which will encourage more hams to discover the thrill and excitement of building their own gear. It must be something which will appeal to everyone and not just a contest for the best home-made rig, etc.

(2) Most QSO's are a crashing bore. This theme has been played for years in the letters column. The result of all the attention lavished on it is that things are getting worse than ever. Thank heavens for sideband and the remaining stand of old timers who have sought refuge there from the rig describers who vfo up and down the bands looking for some hapless station so they can again repeat their well

[*Continued on page 14*]

Ed Piller, W2KPQ, the recipient of the Army Award for his work in the establishment of the SSB Technical MARS Network, with Mike Ercolino, W2BDS, owner of Telrex, watch as I tell them how we sunk some of the ships pictured on the Drum battle flag during my tour of duty on the sub (1943-45). Official U.S. Navy photographs

Ev Mayer, KP4KD, QSL manager for Puerto Rico, who I last saw when I dropped in at his shack for a quick visit on my way back from the Virgin Islands, looks on unbelievingly as I describe how the stern planes got stuck one time when we made a dive at emergency speed and almost lost control of the boat, going over a hundred feet below the boat's safe depth.
Official U.S. Navy photographs

New! hallicrafters "2 and 6"

World's first complete two and six meter radio station .. features transistorized, built-in power supply

COMPLETE SPECIFICATIONS

General description: The SR-34 is designed for either AM or CW and combines, for the first time in one compact package, the complete functions of a two *and* six meter radio station. It operates on 115-V. A.C., 6-V. D.C., or 12 V. D.C. and features a highly efficient transistorized power supply for the 6 and 12 volt operation.

Exclusive features: The perfect unit for short-range portable, fixed or mobile communication, the SR-34 meets—and exceeds—F.C.D.A. matching-fund specifications. The crystal sockets and transmitter tuning controls are concealed behind a panel which may be sealed to prevent tampering. Instantaneous selection of desired voltage possible and also "crossbanding" between the two and six meter bands. The specially designed cover has mounting clips for two-band antenna, owner's microphone, and cords.

Both receiver and transmitter may be used for C.W.; key jack and adjustable B.F.O. are provided. Drip-proof case is specially designed for safe outdoor use.

The transmitter is crystal-controlled; up to four crystals may be switch-selected. A fifth position on this switch permits external V.F.O. operation. Band selection also is front-panel controlled.

The receiver is a double conversion superheterodyne, having a quartz crystal controlled secc oscillator. This offers outstanding selectivity : high image rejection. Highest stability is obtai through separate oscillator and R.F. sections each band.

All receiver functions provided—S-me B.F.O., ANL, etc. Sensitivities average 1 microv on both bands. Transistorized power supply eli nates noisy, erratic operation encountered w vibrator-type power supplies.

Front Panel Controls: *Receiver:* Band Selector (54 mc., 143.5 to 148.2 mc.); Main Tuning; Ser tivity; Audio Volume; B.F.O. Pitch; Squelch Lev Headphone Jack. *Transmitter:* Function Swi (P.A., Rec., Cal., AM, CW); Power On/Off; Ba Switch; Crystal Selector and V.F.O.; Oscilla Tuning; Doubler Tuning; Tripler Tuning; Fi Tuning; Final Loading; Meter Switch.

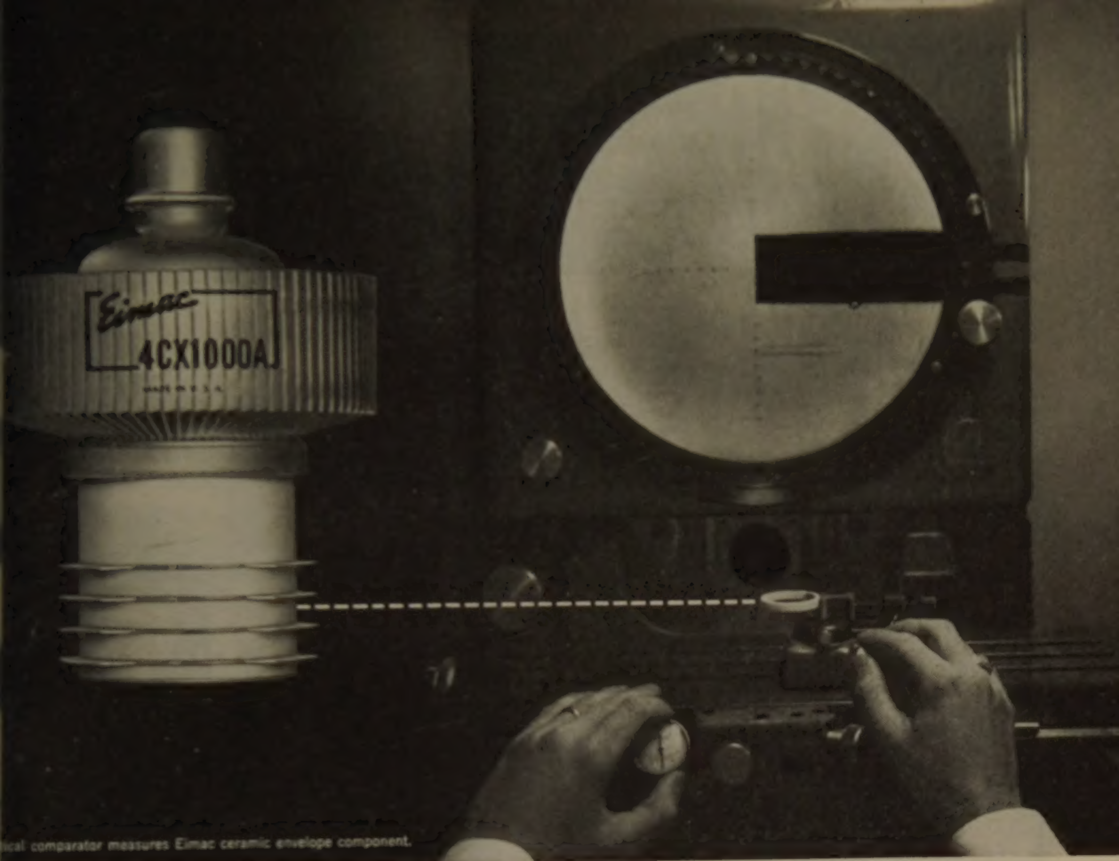
Power output: 6 to 7½ watts on 2 meter, and 7 10 watts on 6 meter AM or CW, 100% mod. ne tive peak clipping. *Rear Apron:* Speech input le control; key jack; P.A. speaker terminals; m selector (high Z or carbon); mic. input; A.C. a D.C. fuses; power plug.

Available with convenient terms from your Ra Parts Distributor.

Export Sales: International Division, Raytheon Manufacturing Co., Waltham, Massachusetts
For further information, check number 6 on page 194.

The new ideas in communications are born at . . . **hallicrafters**
Chicago 24, Illinois

In our 25th year of service



ical comparator measures Eimac ceramic envelope component.

Sixth in a series describing the advantages of ceramics in electron tubes. Previously discussed: impact, heat, vibration, compactness, dielectric loss.

xact Dimensional Uniformity... Is an
imac Ceramic Tube Extra

ctrode spacing is critical in modern high-performance cuum tubes. Dimensional uniformity of the material used the vacuum envelope has a direct effect on the accuracy this spacing. The high alumina ceramic rings used in nac stacked-ceramic tubes can easily be held to tolerces of ± 50 millionths of an inch at production speeds. s degree of accuracy is not possible with glass techniques high speed production.

curate control of ceramic envelope materials results in eater tube-to-tube uniformity of both mechanical and ctrical characteristics. It permits close control of small ctrode spacings necessary in the production of reliable es for UHF operation.

Other important advantages of Eimac ceramic tubes are: resistance to damage by shock or high temperature; compactness without sacrifice of power; ability to withstand rigorous processing techniques that lead to exceptional tube reliability, uniformity and longevity.

Whether you build or buy your transmitter, reliable Eimac tubes will give you maximum watt-hours per dollar.

Write our Amateur Service Department for a copy of the booklet, "Advantages of Ceramics in Electron Tubes."

Eimac®

EITEL-McCULLOUGH, INC.
SAN CARLOS, CALIFORNIA

Eimac First with ceramic tubes that can take it

For further information, check number 9 on page 194.

Products Designed and Manufactured by Eimac

Negative Grid Tubes
Reflex and Amplifier Klystrons
Traveling Wave Tubes
Vacuum Tube Accessories
Vacuum Switches
Vacuum Pumps

Includes the most extensive line of ceramic electron tubes.

de W2NSD [*from page 9*]

rehearsed station description.

All of us were pretty shakey when we got on the air and suffered from mike fr The usual solution to this difficulty is to out a memorized spiel which gives the im sion of glibness and competence. So wha you talk about on your last few cont Don't sit there feeling guilty and hating . . . we're all in the same bucket. But we have to be. Now if some of you fellows have some training in psychology, etc., w turn your mind to the problem I'll bet could come up with an article or two w would give all of us some good hints on to plunge into a conversation with some we've never met.

Jules Madey, K2KGJ, recipient of a recen Navy Award for his work in phone patching for the Navy stations on Antarctica, operates the KWM-1 aboard the USS Drum (SS-228) during the National Convention in Washington, D.C. Filling out the K4NAA cards in the foreground is Tom McCullough, W1HRO. Chap in background gave call of KC4AF, obviously a fake.

Official U.S. Navy photographs

Usually I try to mention several hobb during my first couple transmissions in c the other chap has a mutual interest. This f quently results in some very interesting co tacts, but this is a clumsy system and of misses. I'm sure that some of our readers c work out a reasonably foolproof system for How about it?

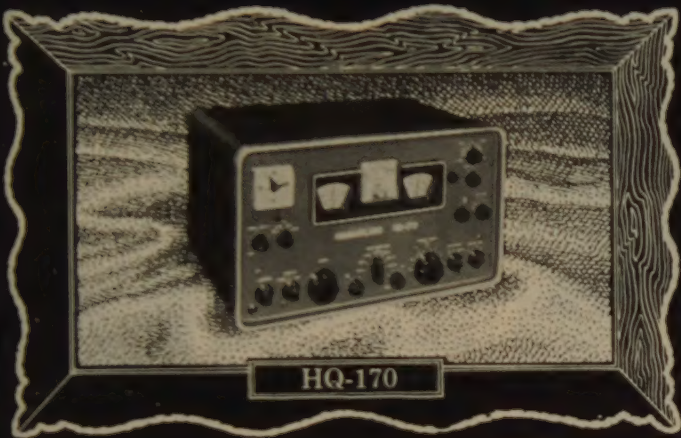
Our Shared VHF's

The Air Force got a little nervous about editorial a couple months back when I me tioned that the government services who going to share our frequencies with us will using powers on the order of ten to twe megawatts. Seems that the "government" this case is them. They dusted off a sm

[*Continued on page 168*]

Quality...

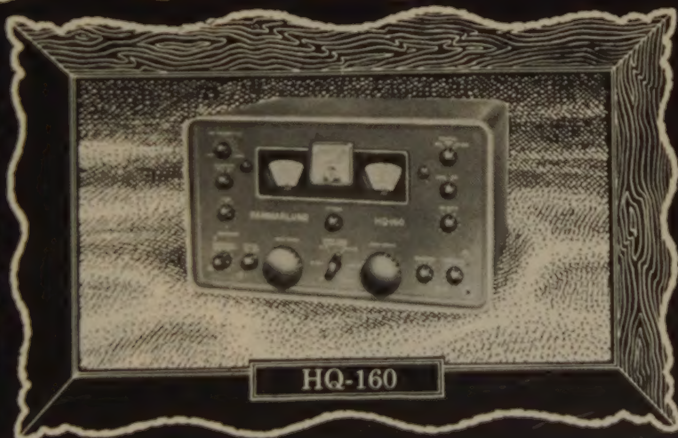
UNSURPASSED — ANYWHERE NEAR THE PRICE!



HQ-170

For the amateur who wants the very finest in SSB receivers. Contains all the functions necessary for solid contact in today's crowded bands. 17-Tube superheterodyne. Dual and triple conversion. Separate vernier tuning. Adjustable 60 db notch filter. 6, 10, 15, 20, 40, 80 and 160 meter amateur bands.

$359.00 *



HQ-160

You could pay twice as much, and get no more than the general-coverage HQ-160 quality. Dual conversion. 540 KCS to 31 MCS. SSB. Q-Multiplier. Electrical bandspread. Separate stabilized BFO. Crystal calibrator. Adjustable 60 db notch filter. 13-Tube superheterodyne. Crystal-controlled 2nd IF.

$379.00

Here's the pair that's making history in amateur radio. Never before has so much genuine quality and performance been offered at such low prices. Now the amateur can choose the one he wants and be sure that he's getting the very best buy in either a straight ham band or general coverage receiver.

*Telechron clock-timer, $10 extra.

Established 1910

HAMMARLUND

HAMMARLUND MANUFACTURING COMPANY, INC.
460 West 34th Street, New York 1, N. Y.

For further information, check number 10 on page 194.

For further information, check number 11 on page 194.

Feenix, Ari

Deer Hon. Ed:

Aren't you thinking it are unfair when thi happening all around you, and yet you c doing those things? I meening it only tak little forsite and you not getting into this all. What are that old saying—an ounce prevenshun saves a stitch in nine!

Like taking this new stereo craze. Ste tape recorders, stereo LP records, stereo pl back heds for your fonygrafs, stereo speek stereo earfones—next thing you knowing t be selling stereo heering-ades. Okeh, so I s ing, why not having stereo amchoor radio

Of coursely you can doing it the hard w You can using cupple single-sideband xmitt one on upper and other on lower sideband, a having amchoor at other end having cup single-sideband reseevers, feeding on to c earfone and other to other earfone. Scrat figyouring out the bux involved and desid not to doing it the hard way.

Also another way to doing it. Can putti cupple different xmitters on air at same tim Like saying one on twenty fone and other ten fone. Having amchoor on other end usi cupple reseevers, and you all set. Of course having to have skip just rite so both ten a twenty sigs getting thru, otherwise getti monaural stereo, and Hon. Ed., nothing mo sterile than monaural stereo.

Scratchi thinking about that kind siste reel hard, but finely desiding that having plen TVI with one rig on air, without putting cupp on at same time. Besides, how often you findi amchoor at other end with cupple reseever

No indeedy, no need doing hard way wh can finding easy way. So here are detales c STEW sistem I thinking up. (STEW are stan ing for Stereo The Easy Way).

This are complicayted to explane, so watc ing carefooly. Let's assuming you are amcho "A". You calling seek-you fone-patch loc When getting answer, finding out tellyfo number of other amchoor and calling him c tellyfone. You telling him that when you cal ing seek-you on your rig he should also turnin on rig and putting your voice from fone lin out over the air. Now you having one end c stereo.

[*Continued on page 155*]

More "WORKABLE WATTS" per dollar from GLOBE electronics

"The World's Fastest Growing Line of Amateur Radio Equipment"

540w AM & CW, 700w max. on DSB or SSB (P.E.P.) input

Globe King 500C

W/T $755.00

Relay-controlled, builtin antenna relay, VFO, commercial type compression circuit. Separate power supply for modulator. Time sequence keying

350w CW, 275 AM, 450w SSB (P.E.P.) input

Globe Champion 300A

W/T $495.00

Kit $395.00

Bandswitching, builtin VFO, Pi-Net output, 40-100 ohms, push-to-talk, antenna changeover relay, time sequence keying, ... circuit. Kit with preassembled VFO

Plate Modulated

Globe Scout 680A

W/T $119.95

Kit $99.95

65w CW

Self-contained, bandswitching, 6-80M, with built-in power supply. Pi-Net 10-80M, link-coupled on 6M. High level modulation. Forward Look

90w CW for 10-160M

Globe Chief 90A

W/T $74.50

Kit $59.95

Forward Look cabinet, bandswitching Xmttr. Built-in power supply. Pi-Net. Provisions for external VFO

Bandswitching 6 & 2M Xmttr.

Globe Hi-Bander

Power Input 60w CW; 55w AM on Both 6 & 2M

W/T: $149.95 Kit: $129.95

Regulated screen supply. 4-stage RF section allowing straight through operation. Good harmonic and TVI suppression. RF Stages metered. Provisions for mobile use. 52-72 ohm coax output. New duo-band final tank circuit eliminates switching.

100w PEP DSB Input, Suppressed Carrier 40w AM, 90w CW

Sidebander DSB-100

W/T $139.95

Kit $119.95

Complete transmitter, bandswitching 80-10M. Min. 40db carrier suppression. 3-stage RF section, pi-net; speech clipping. Inverse neg. feedback. Ceramic band and function switches. Narrow bandwidth. Forward Look.

Globe's VOX Model 10

For voice operated control, with extra contacts for auxiliary circuits. Plug in socket at rear of DSB Xmttr. Adaptable for Scout, Champ and similar Xmttrs.

W/T: $24.95 Kit: $19.95

QT-10: Anti-trip accessory for VOX. W/T: $9.95

VFO 755A

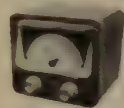
160-10 Meters

W/T: $59.95

Kit: $49.95

For 10-160M, output on 40 & 160M. Vernier drive with shock absorbing features. Self-contained, well-filtered power supply with voltage regulation.

VFO 6-2



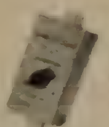
W/T: $59.95

Kit: $49.95

Perfect zero beat. Built-in power supply with voltage regulation. Drives 6 & 2M Xmttrs. Temp. compensated. Ideal for Hi-Bander, Sideband ...

Model 666 for 6M, w/t only, $49.95

Power Attenuator PA-1



Use with Xmttrs. up to 70w input: for swamping drive to ... amplifiers. Three power reduction positions. Coax input and output. W/T: $10.95

Antenna Tuner with VSWR Bridge

Globe Matcher Sr.

W/T $79.50

Kit $59.50

... Coax ...

For Xmttr. with final RF input up to 600w, 80-10M. Fixed link coupling in output. Coax input, 2-wire balanced output. Monitor SWR between Tuner and Xmttr.

Globe Matcher Jr., AT-3

For input to Xmttr. of 100w CW, 75w fone or less. Substantial harmonic attenuation. Unbalanced output. Self contained

W/T. $15.95 Kit $11.95

Grounded Grid, Class B or B 6-80 Meters

Globe Linear LA-1

W/T. $124.50 Kit: $99.50

Complete with well-filtered power supply. 200w input AM Class B, 300w DC or 420 PEP input Class B linear SSB or DSB. 300w Class C for CW. Pi-Net 80-10M. 52 ohm Pi-Link coupled on 6M. Extensively TVI-protected.

Versatile Modulator

Plate Modulator UM-1

Modulates RF inputs up to 100w.

W/T $49.95

Kit (less tubes): $32.50

Class A or AB_2 modulator, driver for higher power modulator, PA Amplifier. Matches output impedances 500-20,000 ohms. Carbon or crystal mike usable. Perforated steel cover, $3.00 extra. Supplies 10-45w audio output. Ideal for use with Chief.

Controlled Carrier Type

Screen Modulator Kit

Ideal for use with Globe Chief. Permits radio-telephone operation at small cost. Self-contained. Connections, instructions, printed circuits, etc. supplied.

Kit $11.95

6 Meter Converter

Compact, stable, crystal converter for receivers tuning output frequencies 10-14mc. Cascode RF stage, bandpass coupling, shielded input and output, high sensitivity. Crystal for 10-14mc output supplied

W/T: $27.50 Kit: $19.95

Power Booster PB-1

For straight through operation on 6M (plugs internally into Globe Scout); approx. 50% more power output, while attenuating harmonic and further suppressing TVI.

W/T: $21.95 Kit: $14.95

Peak Limiting Pre-Amplifier

Speech Booster FCL-1

W/T: $24.95 Kit: $15.95

Perfect for Scout, Hi-Bander & other Xmttrs. Clips and filters speech frequencies at pre-set amplitude. Response 300-3500 cycles. Increases modulation intensity.

See Your Favorite Distributor For the Full Line From GLOBE electronics

3417 W. BROADWAY
COUNCIL BLUFFS, IOWA

For further information, check number 12 on page 194.

CLUB BULLETINS

Marvin D. Lipton, VE3DQX
311 Rosemary Road, Toronto 10, Ontario, Canada.

The August issue of QRM, the monthly bulletin of the Tri-County A.R.A'ssn. Inc., headlined a column about the "New Mr. Ohm.". The club appoints one of its members "Mr. Ohm" for one meeting. The fifth person to introduce himself to "Mr. Ohm" wins a free prize. Since "Mr. Ohm's" identity is kept secret, a member is compelled to shake many hands if he intends to win the coveted prize. This is an excellent means of promoting closer ties among club members.

The RF Propagation Soc. of Canada, in its publication, RF, told of a Hamfest breakfast that was televised over CHCT-TV. The program, which was viewed in Calgary and Lethbridge on Sunday, August 24 at 1015 AM, was the first of its type to be produced anywhere in the world. It's encouraging to learn that hams are finally getting on TV the right way. Hi.

Doris "Butch" Singer, K9IXD, editor of Hawk's Eye View, Hoosier Amateur Women's Klub, mailed in a clipping from the Sunday Indianapolis Star Magazine. More than a page of the Sunday paper was devoted to the activities of the Indiana YL operators. A number of good pictures illustrated the article, which helped inform the public of our fascinating hobby. To the gals of Indiana we tip our hats for such splendid publicity.

While the above members of our News Service were furthering the cause of Amateur Radio, we happily welcomed these club bulletins into our ranks: **Parka Hi Lites,** Polar A.R.K., QUA-W4HHO, Charleston A.R.C. Inc., **Keystone Karrier-Wave,** Okinawa A.R.C., **Mobile Sixers** R. C. NEWS, Mobile Sixers R.C., **Ham Fax,** South East A.R.C. Inc., **Bandspread,** Cedar Valley A.R.C., **North Kent Radio,** North Kent Radio Soc., (England), and **The Spritzer,** The Lancaster Radio Transmitting Soc.

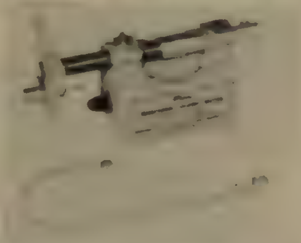
73 Marv. VE3DQX.

CQ NEWS, the official news release of the Club Bulletin Department, is issued monthly to full and associated members of the CQ News Service. Editors of Amateur Radio Club Publication are invited to join the News Service gratis. Amateur Radio Clubs not publishing bulletins may become associated members free of charge by notifying this Department. Contents of CQ NEWS are extracted from affiliated club bulletins. Associated members are granted full membership upon publication of a club paper.

More than two years was spent in the design and development of this line of antenna hardware and accessories. These rugged, durable cast aluminum alloy fittings makes beam building easy as A-B-C. Most any type or design of antenna can be fabricated.

Signals are from Custom Made Antennas

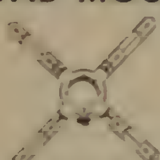
Reactance Gamma Match



For 6-10-15 and 20 meters DESIGNED FOR COAXIAL LINES FOR PERFECT UNITY. POWER TO 1000 WATTS AND [illegible] line to balanced antenna. Will fit CESCO "Oxen Yoke' [illegible] CESCO Oxen Yoke [illegible] clamps are used. Makes antenna tuning extremely easy. Tune in five minutes. Gamma unit becomes part [illegible] instructions and easy tuning method.

AMATEUR NET **$14.95** EA.

QUAD MOUNT



A [illegible] mounting quad arms [illegible] are angle shape which permits [illegible] aluminum tubing sizes from 1 [illegible] 2" diameter, convenient clamp type [illegible] alignment adjustments after assembly. [illegible] not required. Designed for use with [illegible] 2" aluminum irrigation tubing boom.

AMATEUR NET **$6.95** EACH

COMPLETE QUAD ARM KITS

Consisting of 5 ft. lengths 1¼" aluminum tubing swagged to 1" diameter and with fibreglass telescoping inserts. Available for dual 10 and 15 meters and/or 20 meter or all band construction. Write for details and prices.

COAX DIPOLE DRI-FIT CONNECTOR

Handles Power to Maximum Leagal Limits

The most ideal connector ever made for dipole antennas. Install in minutes. Completely moisture proof. For use with coax cables RG-8, RG-58, RG-11, RG-59 and 300 ohm twin tubular. Has eye pull up for inverted V's. One piece aluminum alloy construction. Weighs only 2 oz.

Amateur Net **$2.95** ea.

SMALL YAGI CLAMP

For 220 and 144 mc antennas. A one piece aluminum casting for standard ⅝" T.V. antenna elements. Will fit drilled boom 1", 1⅛" or 1¼" Diameter.

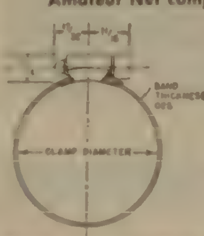
Amateur Net less hardware **29c** ea.

HEAVY DUTY YAGI CLAMP

For 2, 6 and 10 meter antennas. One piece aluminum alloy casting for standard ⅝" rolled T.V. elements as used on X antennas. For 1¼" tubing boom. Boom drilling not required. Element holds can be drilled out to ¼" for 6 meter and light weight 10 meter construction.

Amateur Net complete with hardware **.69**

ELEMENT EXTENDING CLAMPS



All stainless steel, for clamping inserted end sections of elements to main center element. Available in two sizes. Part number 6410 for elements ¾" to 1" dia. Part number 6416 for 1" to 1½" dia. elements. Either Size

Amateur Net **.59**

BEAM ELEMENTS

Complete fabricated beam elements for 10, 15 and 20 meters. Made of 1¼" aluminum tubing center [illegible] swagged to 1" with 1" inserts. 20 meter [illegible] each element sufficient in length to serve as a director, dipole or reflector.

Band	Amateur Net
10	$10.95 ea.
15	14.95 ea.
20	19.95 ea.

If not at your dealer send orders direct or write for national and export dealer listing.

CONTINENTAL ELECTRONICS & SOUND COMPANY
6151 DAYTON LIBERTY ROAD DAYTON, OHIO

For further information, check number 15 on page 194.

OVERSEAS ECHOES

Thomas K. Aalund, K2VBI
Box 13, Roslyn, L. I., New York

Last month we mentioned that we are maintaining records of the latest QTH listings. We now also have the complete listings, as of August 1958, for HB and HE. In this connection it might be of interest to you to know that while most Swiss ham calls are HB9, you may also find some HB4 calls. These are operated as club stations of the armed forces. The calls are HB4FA, FB, FC, FD, FE, and FF. This information we located in **Old Man,** August 1958, HB.

1250 mc DX? DL6MH/p worked OK1KDO/p (operated by OK1VR) during the Polni Den 1958 contest. They believe this to be the first international contact on that band, according to the above magazine.

The RSGB Bulletin, August 1958, G, has a four and a half page article with the title "Amateur Television System Engineering," by M. Barlow, ex G3CVO/T. Among other things we were very interested to note that the British Amateur Television Club has established certain standards for connectors, B+ voltages, signal levels, etc., and this naturally assures the possibility of interchanging components between various members of the club for testing purposes. A very sensible idea.

VK6EC/T continues his series of design and construction articles about amateur television in the July issue of **Amateur Radio,** VK. A video mixer unit is the subject of this article, while the next one will describe the master monitor. It is suggested that persons interested contact him directly, the QTH being as follows: E. E. Cornelius, VK6EC/T, 157 Wood Street, Inglewood, Western Aus.

If you are having difficulty in getting official permission to operate amateur radio in certain locations, we want to make your mouth water even more by telling you that VE1BZ has recently been appointed Lieutenant-Governor of Prince Edward Island. He was one of the first VE's to use SSB and by now he should be operating directly from Government House. This information was contained in the "SSB Topics" column of **The Short Wave Magazine,** August 1958, G.

From **Der Funkamateur,** July 1958, DM, we note that zone 23 contains the call UAØWA. This adds to rumors about the existence of that station in zone 23. For a while even some magazines from behind the shielding (iron curtain to you) suspected this to be an invented call. The same issue also gives a detailed listing of zone locations of all UA9 and UAØ calls. It might interest you to know that in most

ERE'S YOUR CHANCE

to get a B&W transmitter that:

- Covers All Bands from 80-10 Meters
- Permits VFO or Crystal Control on All Frequencies
- Provides Versatility for AM, CW and SSB with the 51SB-B
- Features Built-in TVI Suppression
- Has Components Conservatively Rated for Maximum Output
- And . . . All at the Lowest Cost for Comparative Value

W 5100-B TRANSMITTER
CERTIFIED BY FCDA
ITEM NO. T-32

5100-B $525

There isn't a transmitter on the market that gives you more versatility than the B&W 5100-B . . . regardless of price. In spite of superb performance, the 5100-B is as competitive in cost and often under many comparable units.

Designed for discriminating hams, the 5100-B is engineered to the highest degree by professionals. Layout and circuitry are skillfully designed to assure a minimum of harmonics and distortion.

As a basic for novice or oldtimer the 5100-B is perfect for future addition of SSB by plugging in a B&W 51SB-B. If you're ready for maximum power you can add the B&W L-1000-A Grounded Grid Linear Amplifier. This addition will give you 1000 watts peak envelope SSB-875 watts CW and 375 watts linear AM phone.

Here's your chance to get on the air with a top-quality signal. Buy a B&W Model 5100-B transmitter today. If you want additional information, before you buy, see your favorite "ham" dealer or write the factory direct.

Complete assembly
5100-B, 51SB-B

Barker & Williamson, Inc.

For further information, check number 17 on page 194

Bristol, Penna.

OTHER B&W AMATEUR EQUIPMENT: Transmitters AM - CW - SSB • Single Sideband Generators • Single Sideband Receiving Adapters • Dip Meters • Match Masters • Frequency Multipliers • Low-Pass Filters • T-R Switches • R.F. Filament Chokes • Transmitting R.F. Plate Chokes • Audio Phase Shift Networks • Band Switching Pi-Networks • Cyclometer-type Counters • Antenna Co-axial Connectors • Baluns • Variable Capacitors • Fixed and Rotary Type Coils • Band Switching Turrets • Standard Inductor Materials • Miniductors • Complete line of Amateur Air-wound Plug-in Coils • Variable Plug-in Links • Faraday Shielded Links • Misc. Coil Mounting Assemblies • Misc. Frequency Marked Dial Plates • Misc. Knobs • Ceramic Jack and Plug Bars

countries behind the shielding you are dealin with a club station and not with one operate by an individual if the first letter after the pre fix is K and it is a three-letter call. Two lette calls usually indicate individual station Among the information in the above magazin was the note that UAØGP/Ø is or has recentl been operating in zone 23.

We recently received from VERON, th amateur radio organization of PA, a batch c their monthly bulletin **DX Nieuws,** and foun same very interesting. Latest contests, QTH c rare new DX stations, a listing of availabl diplomas are only a part of the very compac but very informative bulletin. The bestfilled 1 to 18 (number of pages varies from month t month) we have had the pleasure to read in long while.

The Short Wave Magazine, September 195 G, describes a very neat two-meter transmit ter of 75 watts. The power supply and modu lator are also described and detailed construc tion and lay-out notes are supplied in th article, which is from the pen of G3CGC American equivalents are available for th tubes used.

Frequently others know more about yo than you do yourself—this has been said mor than once and we find it to be true. We know that we have more radio amateurs in th United States than in any other country, bu does that also mean that we have the highes amateur population density? Not at all. In hi August editorial in the above magazine G6FC does some analyzing of amateur population density and comes up with some interesting figures. Picking out a few of them we find tha we have 11.7 amateurs for every 10,000 o population in the United States. Very nice, bu still only second best. In New Zealand the figure is 12.0 and this is the highest in the world.

In view of the forthcoming Geneva confer ence conventions are being held around the world, and the DARC, as host club of the IARU Region I convention covers the proceed ings and results of this convention in detail in the **DL-QTC,** DL, September 1958. We note with pleasure that there are indications in mos European countries to maintain a *Status Quo* a far as the frequency allocations for amateurs are concerned. The special call DLØIARU wa assigned to the station operating at the conven tion and appropriately enough it caused some very special BCI. The PA-system in the main convention hall was turned on and the opening ceremony was about to start, but the speake did not have much of a chance as at the same time DLØIARU started operations and the lon mike cable of the PA-system worked as an an tenna. The result was that the convention wa accidentally, but appropriately enough, opened with the "CQ—CQ—CQ—from DLØIARU" feeding through the PA-system.

73, Tom

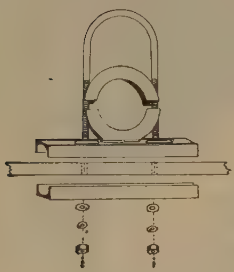
For further information, check number 20 on page 124.

New Amateur Equipment

Making Your Own Beams

Many of us, reading all these articles on building beams, would really like to have a try at some of these newey designs. We'd also like to save a little money over the price of a commercial array. All this has been easyfied by Cesco with their new line of beam antenna hardware.

They have five different types of gadgets which do just about everything you could ask . . . beamwise. Starting at the end of the beam they have "Element Extending Clamps". These clamps are used to hold two telescoping elements together and come in two sizes to cover from ¾" to 1½" diameter elements. They have a worm screw construction so they can be tightened with a screw-driver. 59c each.



Next are the element clamps which come in sizes to fit pipe or tubing from ¾" to 1½" diameter. These are cast aluminum alloy pieces which form fit the tubing allowing the element to be attached to the boom. For the boom attachment they have cast yokes in all sizes from 1½" to 3" diameter. To hold the units together they have three sizes of "U" bolts which cover all situations from 1½" to 3".

For instance, to mount an element on a boom you would need an element clamp, a yoke, and a "U" bolt. Price is $2.29 total, for any size.

There is still the problem of fastening the boom to the mast. This is taken care of with the $5.95 boom mounting set of two mast plates (1¼" or 1½"), two boom yokes (1½" to 3") and two "U" bolts. For really big arrays there is a heavy duty boom mounting set which will fasten any size boom up to 3" to any size mast up to 3".

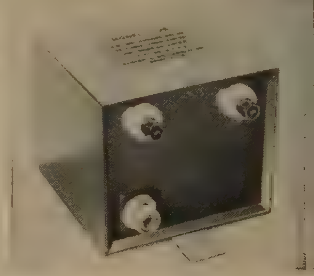
All you need is the tubing, a hack saw to cut it to the right size and some of these clamps and you are in business.

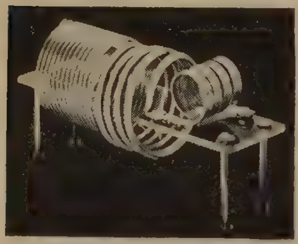
While we're noting the hardware made by Cesco we should mention their small Yagi clamps for VHF beams which will hold ⅜" elements on a 1" to 1¼" boom (29c each) and the heavier duty clamps for 69c.

Quad? For $6.95 you can get an aluminum alloy cast spider for mounting the quad arms on a 2" aluminum irrigation tubing boom. See Ad on page 20 & 21.

B & W Balun

This new balun by Barker & Williamson, Model 725, feeds a 75 ohm up—balanced line to a 300 ohms balanced line over the range 1.5 to 30 mc. It will handle a 1000 watts on AM or CW and up to 4 KW PEP on SSB. This is an ideal unit for coupling the low impedance coaxial output of a transmitter to a 300 ohm multiband antenna system. More facts? Gouge out D on page 194 for details.



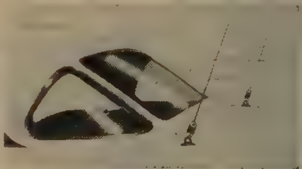


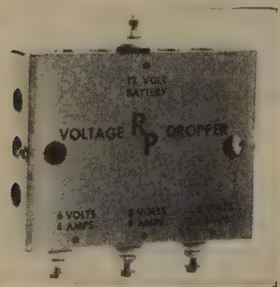
1 KW Coil Assembly

Illumitronic Engineering has a new Air Dux coil designed for pi output circuits. The high frequency coil sections are silver plated for high tank circuit efficiency. A complete technical sheet is included with each coil. There are two sizes available: 500 and 1000 watt. Tell you what, iffen you'd be interested in perusing a brochure on these and other Air Dux coils, ziggle F on page 194.

Shorty BC Whips

Most of us technological hep types like to sport the newer gimmicks Fie on the ham who still uses one of those old fashioned BC whips on his car. Ugh! Particularly when there is a do-hinkey which you can use to replace it which will unsettle the peasants. Like you can replace it with one of these Electrend Coiltennas (like a loading coil, like) or you can clunk off your present whip at about 3" above the quick and screw on the Coiltenna with 15" whip. Particularly effective for those who have discovered sports cars. Taggle G on page 194 for tepid scoop.





Six from Twelve

Rue Products has given Ohm's Law some serious exercise and come up with a resistor for dropping your 12 volt battery voltage down to the 6 volts you really need. The resistor is mounted in a sturdy steel box and the terminals are all marked for input and output at three current drains . . . 4, 6, and 8 amps. Cost is $4.98. In case there are any details we have overlooked you can cross out H on page 194 and we'll get Rue Products to send you all the info they can think of.

Letters . . . to the editor

Letters

Dear Wayne:

I have written so many letters. None of them have yet been printed. You guys probably write them yourselves. I'll bet you a subscription to QS . . . er ah I mean CQ, that you won't print this letter. Hah.

(reluctantly) yours,

Bruce Dembling, K2DQU

Hmmm, send this chap one of our handy new high priced subscription forms . . . he owes us a subscription.

Reciprocity

Dear Wayne:

I have read with interest remarks in recent issues of CQ about steps to grant reciprocal licensing facilities in the U.S., and stories such as those of Dr. J. A. Crutchfield, W7GFM, on "Frustration in VQ5" (August CQ). I would draw attention to those, like myself, who are permanent aliens in this country not yet qualified for U.S. citizenship.

The attitude of the U.S. Government is the same as that of most others in refusing to grant amateur licenses to non-citizens. Yet surely in taking steps to grant reciprocity, the U.S. would have an opportunity to make a small but tangible contribution towards improved international relations.

It can only be assumed that the widespread policy amongst governments of granting licenses only to citizens arises from an unreasonable fear of the security risks involved in a more liberal attitude. In this country at least the rigorous checks on aliens routinely made before admission to the privileges of permanent residence make such a problem negligible. It must also be realized that any maliciously minded person can secure and operate a radio transmitter clandestinely here and elsewhere with little risk of immediate detection.

It may be that the question of licenses for resident aliens is in a different category from the granting of permits to temporary visitors or transients. Indeed, it would seem that an alien admitted to permanent residence is, by the very nature of his stated intentions on entering this country, not unreasonable in seeking an opportunity to submit to an examination for an amateur license, and that this should be granted only after proof of technical competence.

These remarks are not offered in a spirit of carping criticism of the regulatory bodies in this country. Indeed the FCC regulations relating to amateur operation are a model of wise foresight and liberality that only those who have operated amateur stations elsewhere can appreciate.

I hope that you will see fit to give this letter some publicity through your columns.

W. Ross Adey, M.D.
ex-VK5AJ
ex-G3GPC
ex-VK3AJL
2311 Parnell Ave.,
Los Angeles 64, Calif.

Well Ross, the question of security has been brought up several times, but your answer is certainly logical; if anyone wants to use a clandestine transmitter there isn't much to prevent him. The exclusion of aliens from getting FCC licenses stemmed from labor unions and their desire to protect American radiomen from being displaced by imported foreign labor who would work for lower wages. There was no thought of "security" at the time the law was formulated.

Dear Sir

A short while ago, I had a very pleasant QSO with "Mac," W4PEY. We were discussing the "CQ DX" calls from "W" land and we both agree, along with many other European amateurs, it only causes nothing but a mass of QRM on 20 meters, especially CW.

Here in Europe the "W's" are blasting in here every FB. With all the CQ DX's you can imagine what a pile-up it causes here. Many amateurs here will not answer a "W" calling "CQ DX."

So all you "W's" who always call CQ DX PSE try to eliminate all the unnecessary QRM, here and stateside, and try to make operating on twenty meters more pleasant and enjoyable for the amateurs stateside and overseas.

TU 73's

A/1c James P. Fodor, DL4RZ
6911th Radio Grp. Mobile
APO 175, New York, New York

Sure, you don't like the QRM that goes with all us Statesiders calling "CQ DX," but will you DX stations go to the length of not answering such calls? We find that we usually get answers when we call "CQ DX," so why should we stop?

Shocking

Dear Wayne:

I'm with W8DPJ in the letters section of August CQ. I got a dose of the same thing—1500 volts and I am quite sure that you won't catch me doing some of the foolish things I've done before any longer. It is really too bad that all of us thick skulled fellows have to almost get killed before we start to think about what the currents we are often so close to can really do to you. They can do plenty—take it from someone who has personally tried it! Those white complexions and bleeding hands that W8DPJ talks about are no fun. I'm just glad I'm still around to be a little more careful from now on. Even with that mean 110 volts that nobody gives much credit to as being able to kill you.

73,

Ray L. Sullivan, K5GHP
1011 South Glasgow Dr.
Dallas 23, Texas

KC4AF

Dear Wayne:

All KC4AF QSL's have now been sent out. The total is 3490! This includes cards sent with no return postage which were sent through the ARRL QSL bureaus. We have a few cards with no dates or times which means we will have to go through all of the logs. It might be a good idea to insist on GMT times on future contest and DX logs. Many of the cards show GMT times and local dates, which really loused us up.

The QSL gang, headed by W8JIN, W8TJM and W8JJW, really did a fine job. Our logs show 6493 contacts from Navassa and 949 from the Empress for a total of 7442.

Jake Schott, W8FGX
Cincinnati, Ohio

Transformers

Dear Mr. Green:

I have recently seen some letters to the editor concerning hams who wish to wind their own modulation transformers, but can't find a suitable core material available. . . .

I spoke to my uncle, who is president of National Moldite, about this. He told me that National Moldite doesn't sell on a retail basis, but if the hams contact me and tell me what type of transformer they wish to make, he will try to help them out.

The information which I need is: frequency application (if for other than audio frequencies), Physical dimensions, permeability stability desired—and depending on application, Q . . .

Being a ham myself, I hope that I can help out the radio amateurs who are faced with this core problem. Requests which are sent directly to National Moldite will not be handled. All requests should be addressed to my home QTH at 6 Cooke Avenue, Carteret, N. J.

Richard C. Weiss, K2QLV

QRG? Where Am I?

Roy A. McCarthy, K6EAW
737 W. Maxzim
Fullerton, California

This might be the plaintive bleat of a poor little lost sheep, or perhaps a Novice whose receiver calibration isn't of the $500 class, or even an experienced Ham who likes to roll his own. Well, we can't help the poor little lamb, but the Novice and others can locate themselves quite readily with this handy dandy calibrator.

The usual way of finding out where we are, in or out of the band, is more or less the following. A crystal oscillator on the band edge and trusting to the receiver calibration for the rest, or a 100 kc or 1000/100 kc crystal osc. This is of course sufficient to meet FCC requirements, and for more accurate interpolation a 10 kc multivibrator is sometimes used, at least the ARRL handbook says so.

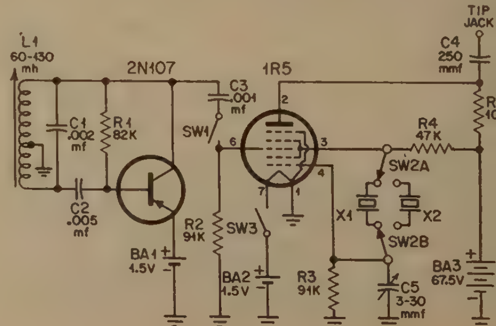
Well, why not a more direct way of getting those 10 kc markers up into the ham bands? It sounds easy, just modulate a band edge xtal with 10 kc signal. It works fine too, else this article wouldn't have been born. In my case, I use a 7 mc xtal oscillator (with harmonics) mixed with a ten kc oscillator (with harmonics). The result is a splurge of 10 kc markers throughout 40, 20, 15 & 10 meters, with a good band edge check point to boot. If you have an ear which is reasonably accurate in estimating up to 5 kc, it's simple to pinpoint your frequency between these 10 kc markers.

Circuit wise, an inexpensive junction transistor is used in the 10 kc oscillator, followed by a 1R5 mixer—crystal oscillator. Battery operation was used for portability and instant operation on throwing the switch. However, in the breadboard circuit a 6BE6 was used also and it performed nicely. A point to consider though is that there is less heating effect causing possible drift with the battery operated 1R5. Since the unit is not in constant use, battery life can be expected to be quite long. Approximate current drains are, 2N107, 60 Microamperes; 1R5 plate, 130 Microamperes; 1R5 screen, 1.05 Milliamperes; filament, 50 Milliamperes. A separate battery is used on the transistor for stability and it runs continuously.

The 10 kc oscillator can be calibrated in a variety of ways, such as on a Berkely counter, oscilloscope or "dead beating" a series of broadcast stations, (SW1, should be closed, and also the crystal oscillator operating, since the tube loads the transistor circuit slightly. The harmonics of the 10 kc osc. are weak but usable up to 1,000 kc for this check.) or you can even just count the number of beats between 7,000 and 7,300 kc on your receiver bandspread dial, and come pretty close.

The use of the calibrator isn't limited to the

[*continued on page 170*]



Amateur Satellite Reception and Recording

F. K. Dearborn
Geophysics Research Directorate
Air Force Cambridge Research Center
Air Research and Development Command
Laurence G. Hanscom Field
Bedford, Massachusetts

The response of amateurs and others to the request for measurements of the U. S. Satellite signals has been gratifying and, as was expected, has provided valuable information. I would like to review very briefly the two major fields of measurements that may be undertaken by independent investigators such as amateurs and SWL's.

The first field is that of doppler measurement which requires the use of receiving equipment of a high degree of frequency stability. It must not be subject to either local or beat oscillator drift nor agc frequency pulling effects. These measurements, then, require the use of a crystal controlled heterodyne oscillator at the carrier frequency, or a subharmonic thereof, or a receiver whose internal construction provides a comparable stability. These measurements can and are being made by various amateurs and the data obtained will be of value in many cases.

The second major contribution is the direct recording of telemetry signals from the satellite transmitters. We have had occasion to request the loan of quite a few amateur tape recordings of satellite telemetry signals which were recorded at what was considered to be critical periods. It has been noted that in all cases they suffer from one particular defect—the use of an heterodyne oscillator either at the carrier or intermediate frequency. It is likely that in most cases the heterodyne oscillator was used for doppler measurement purposes.

Simultaneous doppler measurements and telemetry reception by the same receiver tend to be incompatible. Assuming an amplitude modulated transmission, two reasons may be advanced to support this statement:

1. A beat oscillator produces its strongest output signal by heterodyning against the carrier frequency itself. The fact that this frequency varies because of receiver instability and/or doppler shift makes it exceedingly difficult to remove with a filter. If the heterodyne falls within a desired telemetry channel and close to the telemetered frequency, the data

[*Continued on page 186*]

Reading left to right, Frederick A. Brown and the Author, both of Air Force Cambridge Research Center.

Reading left to right, Lorenzo Johnson, Wentworth Institute, and the author.

The Birdcage

by LEE SHAKLEE, W6PQW
130 Hubbard Ave., San Lorenzo, Calif.

It IS an intriguing name, isn't it?

Sorry to say, however, I can't take credit for the appellation. It was called a "Stacked Twin-3" to begin with, but since it perched near a thoroughfare and was easily visible from it, and since quite a number of imaginative Hams travelled that route—well, the "Birdcage" it became.

And quite an antenna it was, too. It towered gauntly into the sky, impressively dwarfing mere Yagi arrays—and not only in size, either.

But I'm getting ahead of myself. It all began one day in the early part of 1946. For months I'd been using my post-war version of the single Twin-3, a duplicate of the antenna which I'd fallen in love with in the halcyon days before WW Two on both Ten and Twenty meters. It had been a performer then, and it was living up to expectations now.

Like most Hams, though, I wasn't satisfied. I wanted more. Well, why not TWO of the little gems, stacked. *Two of 'em? One above the other?* Sure, why not? *How you gonna rotate it?* Oh, it can be done. (This last, vaguely.)

And thus it was that the project began. Slowly, the ideas jelled. It was the physical construction which kept throwing rocks into the lawnmower. The elements, for example, should be maintained in a taut condition even with aging and the inevitable stretching of the wire of which they were to be made. Bamboo poles were out. It was a known fact (through sad, previous experience) that bamboo will quickly sag, drooping the elements below it like a limp bowstring.

Ah-ha! How about a *taut* bowstring? And on top, so the weight will tend to increase the tension? *What's to keep it from flopping sideways?* Anchor it in the middle. *Maybe, but will the ends stay put?*

All right, then, we'll make the "bow", itself, out of material which can't flop to either side —and that settled that. The "bows" (see fig. 1) were constructed of 1x6 pieces of clear redwood. Three egg insulators at each end secured the wires of the dipoles, with jumpers placed in such a manner as to create a long, squatty "S" out of the entire configuration.

The over-all length, including that of the two jumpers, was computed from the formula 480 over Fmc times three.

The reason for the odd-ball number (48 instead of the usual 468, or the free-sp figure of 492, is that end effects were c sidered to be that of a single-wire dipole, wh the length was that of three of them. A co promise was struck (and proved to be am ingly accurate).

Now, the two dipoles of a Twin-3 should spaced about an eighth-wave apart in ord to match an open-wire feedline through t two quarter-wave matching sections of t same impedance. A perfect match could obtained by varying the spacing between t dipoles, and without impairing the gain. B we're dealing with high impedance here. Slig variations have negligible effect on the matc

With this in mind—and remembering th there would be four quarter-wave transform joined at the feedpoint instead of the usu two—it was decided to hold to eighth-wa spacing on each Twin-3. The closer the spa ing here, the lower the impedance. The low the impedance at the center of each three-w dipole, the higher the impedance presented the feedpoint a quarter-wave away. And w four such impedances in parallel—well, it w decided to keep it high for obvious reasons.

In time-honored fashion (time-honored me, that is, on all prior Twin-3's), the eigh wave booms were five foot 2x2's. The 1 "bows" mounted to the booms with an brackets, as in fig. 2.

Fig. 3 shows the single Twin-3 eleme its dimensions and its feed-point. By golly, was shaping up!

Yeah, but it still has to be rotat Remember?

Ugh! That's right. But a ray of hope! Si the antenna is bi-directional, it only needs be rotated through 180 degrees in order obtain full azimuthal coverage. And THA my little unseen kibitzer, pins a different on the donkey.

Hinges—plain, old, ordinary gate hinge will turn through 180 degrees. And they'll h up a barn.

Yeah!

Thus it was that (with a since-abando abhorrance for metal supporting structures 4x4 redwood pole 20 feet long was selected

[*Continued on page 167*]

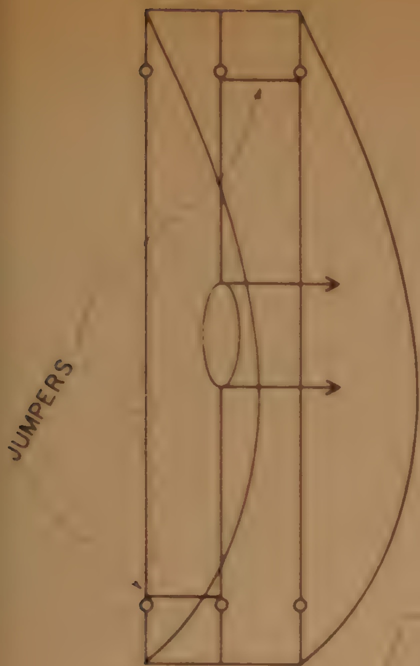


Fig. 1

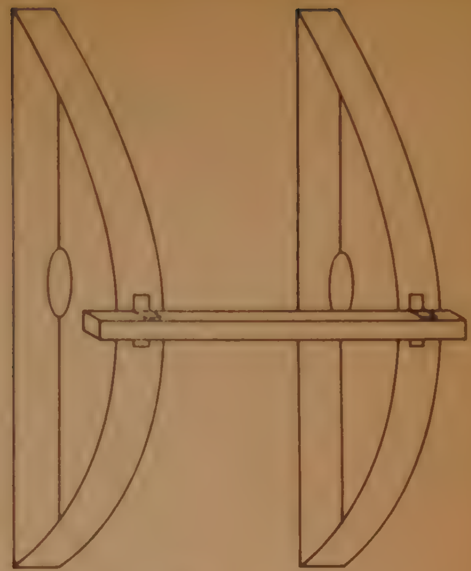


Fig. 2

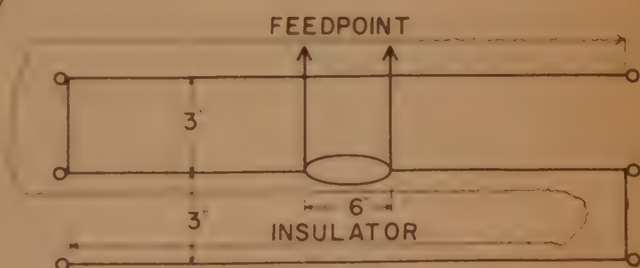


Fig. 3

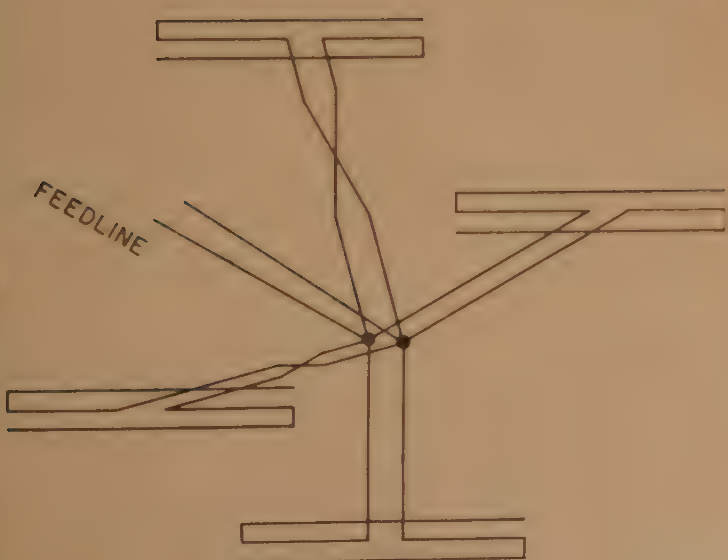


Fig. 4

Anodized Heat Sinks

William E. Bradford, W5I
Radio Station K
Sulphur Springs, T

Throughout the history of electronics the radio amateur has been characterized by his ability to absorb into his hobby practically every technical success in engineering, research and mass production. In a large number of instances he has found uses and capabilities the manufacturer never suspected. When the designers proudly rated the type 10 triode (the bifocal set will remember that one) at 18 mils of plate current, they never suspected that some DX hungry ham was going to remove the base, dunk it in a fruit jar full of oil, and load it up to his favorite color.

But within recent years the amateur has found his ingenuity severly taxed. (Magnetrons are nice, but how much can you say in a microsecond?) And judging from the comment on the bands it appears that far too few of us are willing to accept the challenge and show the manufacturers a few new tricks with transistors. (At this point you can start writing your nasty rebuttal to the editor.)

Yet much of this reluctance about transistors was justified. What can you do with a gadget that will stand only a handfull of volts and practically no current a'tall? The ham who used to read his log by the light from the plates of his pair of 45's gave up in disgust when he read the specifications (a cowardly thing to do) and found that germaniums—like geraniums—start to wilt at something like 40° centigrade. (40° centigrade is just slightly cooler than the temperature of the XYL when she sees what the soldering iron did to the dining room table.) So, by the time you add other little things like poor high frequency response, high noise level, and a theory of operation that made about as much sense as Khrushchev (who ever heard of a hole that drifts around, even in germanium) most of us decided to stick with the vacuum tube.

Those were the early days; the transistor is growing up. Noise is way down. Frequency response in some models approaching the microwaves. Some types with current ratings in amperes. Sure, they're not ready for the final stage of the California KW, but the new power transistors in a mobile modulator will let the rf tubes hog all the high voltage, and the new self switching transistor circuits that make plate voltage out of battery voltage promise to be the nicest thing that's happen to ham radio since somebody (ham, by way) invented the crystal filter.

So we get enthused over each new art about power transistors until the author beg to discuss thermal runaway, ambient tempe tures, heat sinks and stuff like that. But w a minute . . . grandpappy cooled his 1 down by getting the heat out of the tube a into the oil, and after all, from an oil b to a heat sink is little more than a generati

This heat sink—it's just a chunk of st held in thermal contact with the mount surface of the transistor to give the transis heat somewhere to go. Generally speaking larger the heat sink (and we'll admit this over-simplified) the more efficient it is at ho ing the transistor heat down. A slab of th aluminum is a good heat sink—so is a hea gauge aluminum chassis.

Now, at this point we get into *word* troubl The word "base" is used to define both bottom of the case in which the transistor enclosed *and* an electronic base which is part of the transistor drawn as a vertical l in the symbol. In the 2N107 and most other l power transistors the two bases are tied togeth and there is no problem. The trouble beg with power transistors such as the 2N2 where the base comes out as a prong with insulated lead attached, and the collector internally tied to the case of the transist This difference between an electrical base a thermal base can turn a good transistor i a poor paperweight. In any event, for the p poses of our discussion the word "base" only be applied to the thermal base of shell of the transistor and has nothing to with it's "innards".

Assuming that our power transistors h their collectors connected to the thermal b our problems are half solved if we use tran tor circuits involving grounded collectors. drill the appropriate holes in a smooth chunk of metal, goo it up with silicon gre if you wish, bolt the transistor down firmly and start wiring. Unfortunately most circ do it the hard way. If the collector of the tr sistor has to go somewhere else electrically fore it goes to ground mechanically (or the ally) then we are going to have to find oursel

little bit of insulation before we get to the rilling and bolting and wiring and fuse blowng stage.

Most of the do-it-yourself articles suggest hat the home constructor separate the tranistor from the chassis or heat sink with a piece f mica a couple of mils thick. A mil, in this ase, is a unit of measure, and one mil is hinner than the ham on a drugstore sandwich. And since ham is a poor insulator, this is not he solution we need. In fact let's face it, ractically every usable *electrical* insulator is lso an excellent *heat* insulator. Sure, within imits, you can take a good electrical insulator nd shave it down until it's forced to be a good onductor of heat, but when you reach that oint you're dealing with thousandths of an nch, and that's even narrower than the space etween the edge of the band and the first CQ, specially when you're splitting it with the XYL's kitchen knife. So that's where anodizing omes in—which is why we are here in the irst place.

Anodizing is simply a process of changing he *surface* of a piece of aluminum into alumnum oxide. Most oxides are undesirable. If t happens to iron, it's called rust, but aluminum oxide is a thin, tough, insulating surface to which we can thermally attach, yet electrically nsulate, our transistors.

Anodizing

To anodize our aluminum we merely need to expose its surface to free oxygen (not molecules—just atoms). The most practical way s to immerse our surface in a sulphuric acid solution and establish a positive voltage on it n relation to another piece of aluminum also n the same solution. Free oxygen will be generated on the surface of the positive plate, will combine with the aluminum, and become anodized. Those are hydrogen bubbles you'll see coming from the other piece.

Let's start at the beginning and try some. You can either anodize the surface of the heat sink itself or you can anodize washers to put between the heat sink and the transistor base, or if you wish you can anodize only a *part* of the heat sink, simply by only putting that part of it in the solution. Me—I like the washers. You can make them a little larger than necessary and bend up the ends for cooling fins; if you anodize both sides you have a double insulating surface for added protection (matter of fact, it's pretty hard *not* to anodize both sides).

First, choose a piece of aluminum that's completely free of burrs, rough spots, gouges and stuff like that. This oxide is thin, and the smallest nick is like a chisel that can punch thru your anodized surface when you clamp the transistor down. My favorite washer material is aluminum disc recording blanks. Steal (or borrow, if necessary) one from some broadcast station or recording studio after they've finished with it. Put it in a sink full of *hot* water, leave it for about ten minutes, and then peel off the acetate. You now have a flat, polished surface that you can comb your hair by, if any. Some aluminum kitchen utensils and some chassis have almost as good a surface, but don't think that you're going to smooth off a beat up chunk of stuff out of the junk box unless you're a heck of a lot better smoother than I am.

Now, keeping in mind those nicks and scrapes, take your washer, heat sink or chassis, and mark and drill the mounting and terminal holes for the transistors. Make them large enough for any necessary insulated sleeving as needed. On transistors with mounting studs like the 2N278 you'll need enough room in the hole for bakelite tubing or spaghetti. Sure, the inside of the hole will also be anodized, but the threads in the stud can cut thru it easily. After you drill the holes for the studs and leads, remove all burrs and projections. Try a sharp pocket knife and work carefully, paring around each hole until it tapers in smoothly from the flat surface. In the case of the anodized washers you will also want to cut them to shape and do any necessary bending at this point. The outside edges of these washers should also be rounded in slightly and de-burred to prevent insulator punch thru.

If you're sure it's deburred, clean it up. Soap and water if it's really a mess. Acetone or clean thinner for the final treatment. Lay off the XYL's nail polish remover, most of it contains oil. We want to anodize aluminum, not finger prints.

Now we need a container for the acid we're going to brew up. A pyrex dish, fruit jar, gold fish bowl (take the fish out first) or other nonmetallic container is fine. If the XYL is out of town you can use aluminum cookware for a pot, in which case the pot can act as that other chunk of aluminum.

Acid H_2SO_4

At this point see your druggist, tell him you'll be careful, and buy some commercial sulphuric acid, specific gravity about 1.85. (the bottle will be heavier than it looks). We need to dilute this to about 1 to 1 by adding water. (The acid in an almost fully discharged car battery is about 1.1, by the way.) The simple way to do this is to put about seven or eight times as much water in the pan as acid. But—**put the water in first.** I've forgotten why, but that's what everybody says, and I'm getting too old to experiment. So, pour the acid into the water—slowly. It tends to sputter, bubble and get warm. Wear your old trousers. (I learned the hard way.) It's also advisable not to do this in the middle of the living room rug. If you can't get full strength

[*continued on page 200*]

Improving the 4 Tube Regenerative Superhet

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A 4 tube superhet using three crystals was described in CQ July 1958. One problem that was recognized was the incomplete rejection of spurious signals. Another problem was the fact that the tuning rate was faster on 14 mc, and the stability was poorer on this band than the others. Rather than fool around with additional tuned circuits, another stage was added.

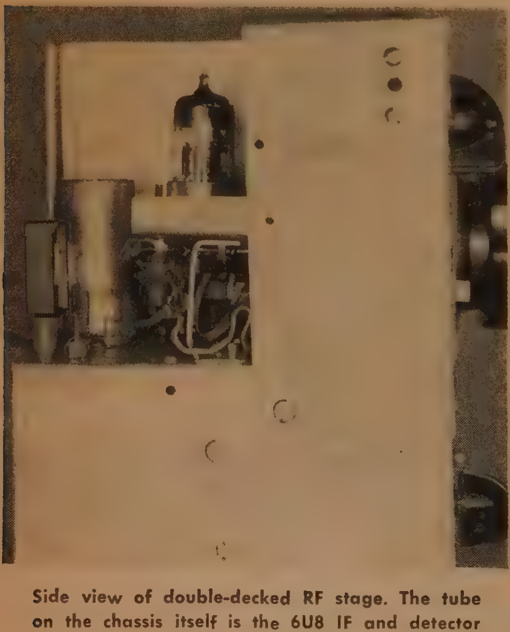
The stage consists of the pentode section of a 6U8 tube. The input circuit was shifted over to take care of the grid tuning of this stage. For the mixer grid tuning, a switch was installed to connect to either one of two mica trimmers. One trimmer was peaked on 7 mc and the other on 3.5 mc. It is not necessary to tune this stage with a variable because the spread in coverage is small.

For 14 megacycle coverage, the rf stage was used as a crystal controlled converter stage. The mixer is then operated on 3.5 mc. In o to effect conversion of the 14 mc incoming nal to a 3.5 mc tunable i-f frequency, 10.5 injection is required. This can be obtained a 10.5 mc crystal, using the triode part of 6U8.

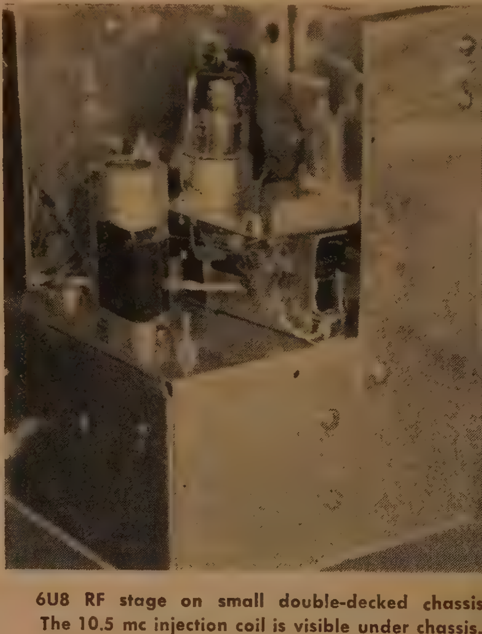
One of the ideas in the construction of set was simplicity. The simplest way to 10.5 mc is to take off a harmonic of the oscillator which is operating on 1749 kc. sixth harmonic is 10,494 kc. There is an e of 6 kc here but this is no stumbling bl All we do is insert a tuned circuit in the p of the pierce circuit of the beat oscillator. consists of 40 turns on the small slug fo we are using. It is shunted with 20 mmfd condenser.

This gives plenty of energy at 10.5 mc

[*Continued on page 181*]



Side view of double-decked RF stage. The tube on the chassis itself is the 6U8 IF and detector tube. The crystal is for the regen detector.



6U8 RF stage on small double-decked chassis. The 10.5 mc injection coil is visible under chassis.

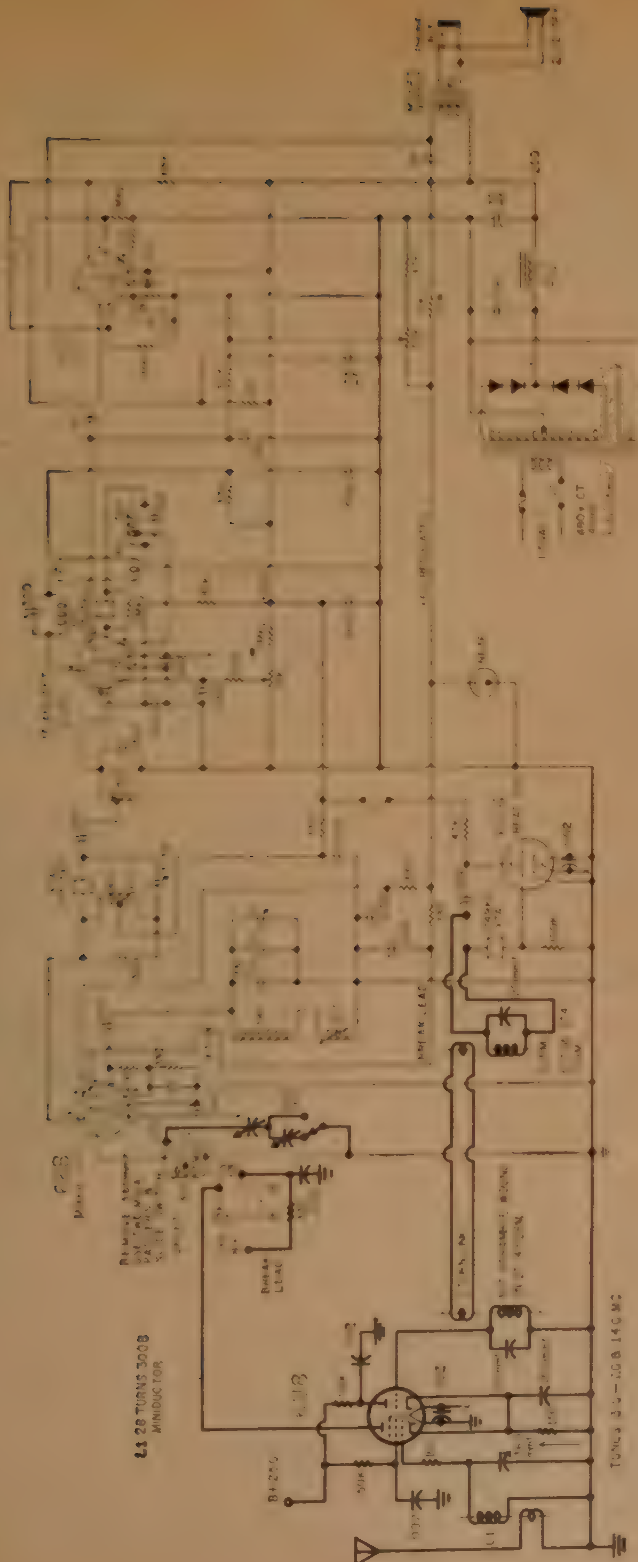


Fig. 1—Bold wiring indicates the additional circuit wiring and components. Dotted lines indicate wires and components to be removed.

The Wandering Sideband

Lt. Col. R. H. Mitchell, W4RQR
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Springfield, Virginia

The idea of the wandering sideband was born in the refreshment area of the Bel-Air Hotel at Piarco Airfield in Trinidad. I was down there as pilot on a training flight for the Navigation School of our Training Group. While sipping a lemonade, I was reading Bob Adams' sideband column which mentioned that several of the SSB gang were approaching DXCC, and, naturally, it occurred to me that it was too bad I didn't have a rig along to give a few of the boys a shot at "2XSSB" from some of the islands we go into on our stops. There was a distinguished-looking gentleman sitting next to me, and, as people sometimes do in refreshment areas, he asked me what I was reading. After he heard what it was, he mentioned that he was a functionary in the British West Indies Federation. Two or three lemonades later, we were fast friends.

Naturally, I asked him about the possibility of getting licenses to operate in some of the islands in the Federation under the US Armed Forces agreements. (It has been possible for a few of the US military in those countries to get licenses.) Another lemonade or so later, he decided that I must be on duty there, since I was on official temporary orders, and things looked rosy. He told me to whom I should write in several of the countries regarding licensing.

So, I got permission from our Group C.O.,

South Caicos harbor

Col. L. S. Moore (a ham in the spark d
to carry along a rig on our navigational tr
ing flights, when space was available, and
operate when I could during our crew re
Help was lined up for the operating. Her
Jolitz, W4DCQ, the phone DX contest king
a few years back, is a civilian electronics e
neer attached to our Group. Phil Ri
W4NZG, who was associated with me
putting a couple of SSB stations on fr
Japan, is NCOIC of our electronics shop. B
were eager to help in operating. I had my 75
and homebrew SSB exciter available for equ
ment—the final and power supplies were
bulky to carry along—but we wanted a be

W4DCQ at VP5AB

transmitter, as the exciter was too low-powe
Arrangements were made to borrow a c
mercial SSB rig of reasonable power, and
decided to buy a multi-band vertical for
antenna. It looked as though the project
in high gear.

Unfortunately, my attempts at licensing
with delay and failure. My BWIF friend's
terpretation of the rules wasn't upheld in
various countries to which I wrote. So, a
two months, I started writing to some of
active hams in countries that had had no
activity to ask permission to set up a ri
their location. Several favorable replies
received, and we were ready to start opera

n the second weekend of the 1958 ARRL hone contest. Suddenly, it developed that the 00-watt SSB rig we had hoped to borrow asn't available, so we had to depend on my xciter. Its 15-watt output didn't look impos-ng, so we started a frantic search for a decent near. Dalton-Hege Radio Supply Co. of Wins-on-Salem, N.C., had a used HT-33 available, hich they generously loaned us. Then it eveloped that we couldn't find a multi-band ertical within a couple of hundred miles, and ad to leave for our first trip with all the wire nd coaxial cable we could find, so that we ould string up dipoles.

We got into South Caicos on the afternoon f March 7th. Jim Bassett, VP5AB, was at he field to meet us. He had the constable, who

VP6LT, VP6KL, VP6ZX, W4DCQ

doubles as customs agent, and one of the three operating trucks on the island with him, and we immediately went to Jim's quarters at the PAA radio station. Incidentally, Jim is a 19-year-old native of South Caicos. He got started in radio with the help of the PAA operators there, and with the added assistance of a correspondence course, got his ham ticket and became chief op for PAA on South Caicos. He has a DX-35 and several other pieces of home-built and kit equipment, and has been giving a new country to a number of hams.

We were delayed somewhat in getting on, as my v.f.o. had jumped frequency and had to be reset. Too, we had no instruction book for the HT-33 and had to figure out how to get it going. Naturally, the trouble was in the cockpit, and after we found the bias-cut-off relay, we were in business. Jim's power limit was 150 watts, so we ran the rig on tune, which is not what the HT-33 was designed for, but it still performed nobly.

Our first contact was on 20 with W4IYC, who had built the first radio station on the island, during WWII. (It was later blown down by a hurricane which virtually levelled the island.) Then we switched to 15, and the party was on. When 15 faded, we went back to 20. At midnight, EST, we switched to 80, and worked stations as far as W6, and were called by KH6's whom we couldn't hear through the

VP4TE

mess. The first—and loudest—station heard on 80 and was the 50-over-9 signal of W4DCQ with a friend of his at the mike. Then we dropped to 40. One lone contact reported us 40-and-over-9 in Maryland, but the 40-meter boys didn't seem interested in DX, so we went back to 20, swinging up to 15 and 10 when they opened in the morning. We finally had to quit at 10 a.m. on the 8th. We packed and got down to the field and the plane came in at 11. We went to Puerto Rico for fuel, intending to go on through to Barbados, where VP6LT and VP6ZX were waiting for us. Unfortunately, the field at Barbados was listed as closed for repairs so we spent the night in Puerto Rico. The next morning we got up at 4 a.m., and got under way. Eric, VP6LT, and Claude, VP6ZX, were at Seawell Field to meet us, and got us through customs quickly. They told us that they'd made arrangements to get the field opened for us the night before, so we had wasted 14 hours. Incidentally, Eric is an engineer with the telephone company and handles the exchanges, while Claude is with the electric company as an engineer, and they are two of the finest gentlemen I've ever met.

We got on at noon from VP6LT's home, and made two quick contacts. Then the phone rang. It was the local radio inspector telling Eric that an SSB signal was all over the 13-meter broadcast band. Claude dashed home to check, and found the SSB signal. During the next couple of hours, we almost rebuilt the exciter. Finally Claude called to see if we were still on. We were installing shielded power leads at the time, and the rig was stone-cold. It developed then that the signal was from a commerical SSB station. So, we started up again and continued until 7 am on the 10th, when we had to pack again and come home. One extremely unfortunate incident developed. Several stations told us we were not the first VP6 on sideband—that they had worked VP6AR on SSB. After thorough checking, it was found that the station claiming to be VP6AR was a phony. After we got home, we got notes from a number of stations saying they had worked VP6AR on SSB, and hadn't

called us, so others would have a chance at VP6 during our limited time. (If the phony cares to identify himself, he can collect a number of QSL cards from Eric, who is the VP6 manager, and from the Radio Inspector in Barbados.)

The equipment used at VP6LT was again the 75A4, my exciter, the HT-33, and dipoles, plus Eric's 15-meter 3-element rotary. The power limit was 300 watts, and we were able to use the HT-33's capabilities a bit better. A number of the active VP6 hams came to see the gear, and most of those were interested in seeing the HT-33. Seems that it was the first kilowatt rig that had ever been in Barbados. They were all quite impressed with it. So am I. This table-top k.w. linear business has been sneaking up on us, and they are a decided improvement over the old seven-foot high, five-hundred pound rigs, especially for those of us who have to move around often. We all found the HT-33 extremely easy to tune and handle, although it took a few minutes to get used to the idea of not having a loading control.

My next scheduled hop was over the week-end of March 21st, and, fortunately, it was going to Trinidad and Jamaica, so I packed the gear again. Herman and Phil had to go to Europe on another trip, so I didn't have their operating help. (I also had to give up the second weekend of the ARRL cw DX contest to make the trip, after having rolled up over 500 contacts in the first weekend, which made my wife consider sending me to see the head-shrinkers.) We arrived in Trinidad on the afternoon of the 21st. VP4TE's son, Malcolm, VP4GM, met me and took me into town. He and I set up the gear at VP4TE, and were starting on the first contact when Louis, VP4TE, arrived from his work at the record processing plant. Louis is in charge of Cook-Caribbean Ltd., and is responsible for the pickup on a number of the steel-band and Calypso records we hear in the States, as well as for the processing of our records for distribution in the West Indies. This is only a small part of his credits, however—former "wireless officer" (equivalent to our FCC licensing and monitoring superintendents); former Chief Signal Officer for the British Army in the Caribbean Theater, builder, owner, and operator of the first broadcast station in British Guiana; first VP3 ham; engineer-in-charge of pioneering airline communication stations in South America; to mention a few. To these, we can now add the first VP4 on SSB, and I'd be willing to bet, the first South American who will work into the States on 144 mc, with the gear he's installing.

We used only my exciter during the first night at VP4TE, as we'd taken the HT-33 back to Dalton-Hege when we got back from Barbados, and hadn't been able to get back to borrow it again. Again, operation was started on 15, with the switch to 20 when 15 went

VP5RS at work.

out. At midnight EST, we were again on and heard W4DCQ booming through. was one of the few who was able to copy 15 watts through the QRN on 80. I went bed again, as I'd been up for 30 hours. next morning, we set Louis' 813 up as a line and really got into business. Stan, VP4 came over and helped us with the operati We took quite a bit of time off so I co demonstrate the tuning of phasing rigs to Lo and Stan, both of whom will be on SSB so While this cost a number of contacts, th should be more than compensated for by fut VP4 SSB activity. We finally shut down 0200 on the 23rd, packed, and went to b Louis got me up at 0530 and hauled me to the field.

We had to stop in Puerto Rico again fuel, and then had to change a set of spa plugs. This delayed us for a bit, but we into Jamaica by 1600 of the 23rd. There knew we wouldn't be the first Jamaica stati on SSB, as VP5MU, who has since return to England, did some SSB work last ye However, a great many stations needed maica. Sam VP5RS, was at the field to m us and cleared us through customs. We stop to see several of the hams, including VP5D president of the Kingston club, who also offered to let us set up on SSB from his hou We finally made it out to Sam's house, wh he describes as a bathroom attached to hamshack. It is located at Spanishtown, old capital city of Jamaica, and is 14 m from Kingston. The house is a ham's drean everything in it is aimed at the enjoyment ham radio, and the affair winds up with 584-foot per leg rhombic aimed at the Sta We tied Sam's Valiant on the exciter and started about 1930. We had to fight low voltage and 40-cycle current there, and I to modify my power supply to get eno voltage to the VR tubes to keep the v. from drifting 500 cycles every transmissi Conditions were poor, and we had to leave early. However, 20 was open, and we w doing fine there. At midnight, we switched 80 again, and worked a number of the b

gain. W4DCQ's booming signal led the pack. Then we went back to 20, where we stayed until 0200. We went on for an hour again before breakfast, then had to pack, and went back to the field, thereby wasting a few hours of Sam's high-priced time. (Sam is the owner of an electronics importing firm, and handles Motorola mobile products, among other lines.) Once again, the ham who helped us put SSB on for the gang was one of the leaders in real ham radio. Currently, Sam is probably best known as the first VP5 on six meters, where he has provided a number of US hams with a new country. One of the things he showed us in his shack was a TV set receiving pictures from Cuba, which makes an old VHF'er think about the possibility of 144 mc work between Jamaica and the States.

We got back to Cherry Point, N.C., that night without event. We'd hoped to get out again in another couple of weeks. However, the combination of a number of circumstances — breakdown in correspondence in one direction, the appearance of several new SSB countries that we had thought to go to, through some fine DXpeditions and some regular activity; changes in flight schedules, etc., prevent our going out until the first weekend in May. By the time I'd returned from the Jamaica run, it was apparent that my exciter was unsatisfactory for our purpose. Some of the reasons have been mentioned already. Two other glaring faults had appeared, too. First, I had to readjust the exciter after every ride in the planes to keep the signals in the band and on SSB. Next, I was the only one who knew enough about it to change bands, which necessitated my staying up all the time to handle band-changing. So, I wrote to Hallicrafters and asked them to lend me an HT-32 for the duration of our expeditions. Hallicrafters replied that they'd be happy to lend me an HT-32 to help some new SSB countries on the air, and where did I want the rig sent? Three days later, I was in Glenview, Illinois, on one of

W4RQR at FG7XE.

our scheduled administrative runs, and borrowed a car from a friend to drive into Chicago to pick up the rig. Three minutes after I arrived at the Hallicrafters office, I was standing out in front again with an HT-32 and a dazed look from the speed and efficiency with which the transaction had been completed. In the meantime, W4UQU at Dalton-Hege had the channels hot to get me a Hy-Gain 14AV multi-band vertical. We tried it and the HT-32 at my home shack before going out on another trip. Despite the IPOIO factor, the HE-32 worked the first time we turned on the switch, and the antenna had the SWR that Hy-Gain claimed for it, and it looked as though our equipment difficulties were over.

They were. We hit Martinique on the afternoon of May 2nd. Andre, FM7WT, was at Lamentin Airport to meet us, and after a lengthy procedure of going through customs, he whisked us off to his house. We set up the vertical on one of his bamboo poles, using guy wires and radials that had been cut in advance. We were on the air within an hour of the time we arrived at his house. The combination of the HT-32 and the 14AV resulted in an extremely simple-to-handle setup, and any ham we showed the gear to could tune it and operate it with about a two-minute checkout. This was a tremendous improvement over the old setup where we had to flip several switches on the exciter, retune a linear, change antennas, and curse a bit to change bands. Herman and Phil were along again to handle their share of the operating, and Andre also pitched in. Andre is an inspector for Radio Central at Lamentin, which is about three miles from the airfield. Unfortunately, his house is about fourteen miles from town. I stayed with Andre, while Herman and Phil stayed in a hotel in the principal town, Fort-de-France. This necessitated some long treks back and forth when the boys wanted to assist Andre with the operating. By the time we left, Herman's cab bill resembled the national debt. However, with all that talent available, we stayed on the air from 1700 on the 2nd until 0900 on the 4th, when we had to pull everything down again for the trip to Guadeloupe. We lost several hours of operating time on the 3rd because of some violent tropical storms. First, it was necessary to shut the blinds through which the antenna lead was run to keep the rain out of the gear. Then, the line power started going off every few minutes. It would come back on again within five or ten minutes, but when it did, it would surge up to 180 volts or so momentarily, and the dial lights on the 75A4 and the HT-32 would flare up like headlights. After this happened a couple of times, we decided to fold up until the power stabilized, and Andre and Madame Meunier took me into Fort-de-France to show me the town and the old fort. After a pleasant afternoon, we went back to Lamentin and got back on the grind,

FG7XE ssb (M. Fabre's house)

VP6LT (second trip)

with only a few interruptions caused by power failures. During the period at Martinique, we worked about six-hundred stations, which was our best effort to date. For the first time, we started working a few of the boys on cw, when the SSB activity ran low. We attributed the improved result to better equipment, since none of us had improved our operating since the last time out.

So, we said a fond farewell to Andre and Madame Meunier at the field and leaped off for Guadeloupe. Upon landing there, we were almost overwhelmed with the hospitality shown us. Ed Dilme, an employee of the US Weather Bureau on loan to the French. met us. The US consul in Martinique had already phoned ahead for our accommodations, and we were set up in the only hotel in Point-a-Pitre, principal town on Guadeloupe. Georges, FG7XE, was also at the plane to meet us, and gave us a fine letter from the airport commandant, M. Emile Fabre, in which he told us that the facilities of the airport were at our disposal, and that we were to set up in his house. Thus, we were able to get on the air by 1430, which is a pretty short time lapse from 0900, considering the fact that we had land transportation time in Martinique, customs clearance there, filing of flight plans, flying, clearing thru customs in Guadeloupe, and getting set up again. M. Fabre's quarters are right on the airport at Le Raizet, which helped considerably in the time factor. We used the metal roof of his house for a ground plane, which saved time in putting up radials—especially since the pre-cut radials were still in Martinique. The FG7XE operation resulted in our greatest number of contacts per hour. We worked over five-hundred stations between 1430 on the 4th and 1000 on the 5th. A number of stations were worked on cw again, but principal activity was on SSB. At FG7XE, we used Herman, Phil, Georges, and myself as operators, and a new name appeared. Jim Perrigoue, our flight radio operator on the trip had been licensed as a ham a few days before, and was sporting the call K4UYM. On the way to Guadeloupe, he asked me if it would be okay if he operated a bit. I was dubious as to his ability to handle hot circuit we were expecting, but figured could try it for a while. Jim has had consi able experience with the snappy operating o on the transoceanic aircraft radiophone circ As the gear was so simple to operate, he handling an operating shift like an old cor man within a few minutes of the time he down in front of the gear, and we had ano operator.

That evening, M. Fabre came in from a to Basse-Terre, and we had the extreme pl ure of several interesting hours with him. Fabre is quite an individual. An accomplis linguist, English is only one of the language speaks fluently. He is a pilot, and is intere in radio, among many other things. Last y he spent several months in the States and managed to interest a couple of companie investing in top-notch resort hotels in Gu loupe. His combination of ability, drive, charm is little short of amazing. Geor FG7XE, works for M. Fabre at Le Raizet. is an enthusiastic ham, and I expect that he do a great deal in the near future to allev the shortage of FG7 activity.

Unfortunately, we had to leave Guadelo on the morning of the 5th.

We then encountered the first trouble our new equipment—Georges liked the Gain vertical so much, we had to leave it him. (This meant we had to get another, w hadn't been an easy job before.) I hope Georges enjoys the 14-AV as much as we So, we loaded the gear again and headed home. After sixteen hours of flying ar the Caribbean, we made it safely. When we back, I immediately sent a letter to Hy- asking them to ship me another 14-AV, closed a check, and asked them to bill antenna to Dalton-Hege.

Hy-Gain did their best to get the antenn me in time for the next trip. However, the tenna arrived about three hours after takeoff. This was over the weekend of 18th. We had been scheduled to go to Juan and St. Thomas, but the schedule

[Continued on page 176]

Positive, Low-Cost Screen-Grid Protection

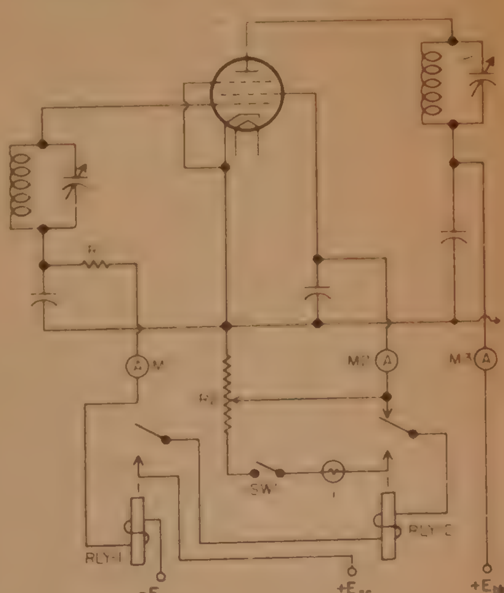
Carl C. Drumeller, W5EHC

When fed from a source of good voltage regulation, the screen-grid current of a tetrode or pentode tube soars to dangerous values when the plate voltage is removed. Lack of control-grid excitation causes the plate current to become excessive unless corrective measures are taken. The use of a clamp tube can control the latter situation, but tubes are prone to failure, and one hesitates to set one tube to guard another without elaborate "fail-safe" precautions.

By the use of two low-cost surplus dc relays, one can secure positive protection from loss of either grid r-f excitation or plate voltage. The only additional items required are a switch, a dial lamp (with mount), and a tapped bleeder resistor.
articles are wired into the control-grid and the

The schematic diagram shows how these screen-grid circuits of a typical pentode r-f stage. The grid resistor, R_1, is reduced by the amount of the d-c resistance of relay RY_1; which should be a sensitive, high-resistance relay such as the ones salvaged from marker beacon receivers. If your tube normally draws more than a few milliamperes, it may be necessary to shunt the relay with a wire-wound rheostat in order to adjust it so as to drop open at the desired minimum grid current. The other relay, RL_2, does not need to be so sensitive, but should close when the screen-grid current exceeds 150% of its normal value. It will be noted that when the relay is actuated, the screen-grid voltage is applied through a dial light (a 60-ma one is about right for a single 813) and a normally-closed spring-return SPST switch to a husky resistor. This resistor should be selected so as to bleed enough current to keep the relay firmly actuated. It is tapped at about mid-point so as to supply a much-reduced voltage to the screen-grid. This enables the operator to proceed with his tuning until a correct and safe condition is achieved. Then he simply presses the switch, which breaks the circuit and restores normal screen-grid voltage.

To sum up, RY_1 holds the plate current to a very low figure by keeping the screen-grid voltage disconnected until the r-f excitation has reached a predetermined value. If the screen current becomes excessive, RY_2 reduces the screen voltage to a safe value and illuminates a warning light; this condition is maintained until a re-set switch is actuated. ■



Mobile Madness—the Telethon

N. A. Krohne, W9SKF
5458 N. Long Island Dr.
Milwaukee 9, Wisconsin

Amateur radio clubs are constantly looking for publicity. It's not easy since few projects seem to capture a newspaper's imagination.

However, with the advent of television, a new form of charity appeal arose—the telethon. Various entertainment personages are assembled before the TV cameras for a program lasting from one day to the next. During this time, appeals are made to the public for contributions to the charity being represented.

Those pledging money to the drive may phone their contribution to one of several telephone numbers located at the scene of the telecast. Radio amateur mobiles are often used to collect these pledges.

With this, and publicity, in mind, the West Allis Radio Amateur Club jumped at the chance of offering their services to a local telethon and its sponsors.

From our trials and experience, have emerged the following suggested methods for obtaining smooth and efficient operation.

Advance Men

Appoint two members to act as a publicity team. They make the initial approach to the telethon sponsors and offer the amateur's services. From then on their duty is to maintain contact with other publicity teams connected with the program. One man should keep a running account of the ham participation. The information is thus readily available to the newspapers and amateur radio publications.

Base Station

Establish a crystal controlled base station capable of continuous operation, preferably away from the scene of the telethon. This will allow function of the control center with relatively little outside interference. A ground-plane antenna or similar vertical radiator should be used in order to favor the mobiles and eliminate beam rotation.

A large map of the operations area mounted on plywood or beaverboard with a street location guide will prove helpful. Zones can be marked off with string supported by pins.

Size of the various zones, as well as the number of them, will vary according to population density, accessibility and where the most
calls are likely to be made. To facilitate ope
tions, the map should be laid flat on a ta
that is accessible from at least three sides.

Prepare a "pledge book," two, if the cont
center is located other than at the scene
the telecast. A dimestore spiral notebook w
do nicely. Starting with the first page, cons
utively number the blank lines to about thr
hundred. These numbers are then referred
as message numbers regardless of who hand
the information recorded in the pledge boo
One book is retained for control center u
while the other is placed with a telepho
operator at the scene of the telecast.

Pledge slips for control center use consist
blank pieces of paper about three by fo
inches in size. If possible, mimeograph the
to provide the following entries: *Mag. No.*——
Name——, *Address*——, *Amount*——, *Ti*
Rec'd——, *Mobile*——, *and Not Collecte*
Cross out the word which does not apply.

Operations

Flag-pins are used to assist control cent
personnel with the quick location of mobil
in the various zones. Call letters are printed
typed on small paper strips and attached
straight or common pins with the aid of Scot
tape. These pins are then stuck in the map
the last address called in by that mobile.

The local telephone directory is a han
item to aid in verifying suspected busine
pledges. At times, an official of some compa
will phone in a pledge giving his name, b
the address of his firm. Consultation of t
phone book will show up the discrepancy. R
quest the telethon people to find out if som
one will be at the address listed on the pled
Useless driving is thus spared the mobiles.

A direct telephone line is needed betwe
the control center and the scene of the telec
when the control center is located some d
tance away. Try to arrange this matter w
the telethon sponsors about a week in advan
if possible. These people will pay for t
service if convinced that the control cen
must be located some distance from the te
thon. They will also provide an operator
their end of the line. However, do not ta
this for granted.

Food should not be overlooked. The co

inuous coffee system will suffice for liquid refreshment. If you doubt this, then ask some hoarse-voiced net op after three or four hours of feverish activity about the subject.

Mobiles

Provide each mobile with a street map of the area marked off in zones corresponding to the control center map. In addition, supply an official receipt book registered in that operator's name and call. These should be furnished by the telethon sponsors. Make sure that each mobile operator is equipped with a notebook to record messages as they come in to him.

Now let's see how all of this works. "Zero" hour arrives and the telethon begins. The TV stations will make announcements that pledges of twenty-five dollars or more (or like amount) will be picked up by an amateur radio car if the contributor so desires. Relax, things will be dull for about an hour, but then the calls will start coming into the control center.

The required information is recorded in one pledge book and delivered to the control center via the direct telephone line, where it is again recorded in the second pledge book. A pledge slip is filled in and handed to one of the two board or map men.

He in turn checks the map for the mobile call nearest the address on the slip. These call letters are written in and the slip is placed in front of the transmitter operator who dispatches the information to that mobile. The pledge slip is then placed in the "OUT" file or a container bearing the mobile's call letters.

When any mobile operator has made a collection, he merely hops on the air long enough to give his call letters. That is, if the frequency is clear at the time. Upon clearance from the dispatcher, the mobile operator then states whether or not a certain message number has been delivered.

The dispatcher notes this information on the pledge slip bearing that message number and hands the slip to the other boardman. He in turn marks the map with that mobile's flag-pin as "the last address visited by that mobile".

From there, the pledge slip is given to the control center's telephone operator who will check it off in the pledge book and notify the other telephone operator that the pledge has, or has not, been collected. This type of triple checking pays off, it also notifies the telethon representatives, and thus the public, that the hams are on the job.

Incidentally, the direct telephone line is a handy means to prod the telethon announcers into giving the amateurs proper publicity.

All told, five men are required to maintain control center operations during the peak of activity, a transmitter op, two boardmen, a telephone operator and one relief man. Light traffic loads result in the use of four men, while two can handle the quiet hours.

In the case of the West Allis Radio Amateur Club, "zero" hour was 9:00 PM. Between that time and 1:00 AM, fifteen mobiles took adequate care of the requests. Only two were needed from then until 8:00 AM the next day. As the telethon gained momentum, more and more mobiles were required until there were twenty-five in the field during the last four hours or so of the telecast.

The traffic pattern should be much the same regardless of the size of the area served. However, the actual numbers of men and equipment required will vary. The West Allis Radio Amateur Club accommodated an area of approximately 240 sq. mi. and one million population.

Watch out for extensions of time. If the program is scheduled to end at a certain hour, and the goal has not been reached, brace yourself, you will be at it for another hour or two. Although the show does go off the air, the hams will still be batting the ether around for quite awhile until the last message has been "delivered".

Do not pass up the SWL's and Novices of the group. These fellows come in mighty handy

[*Continued on page 175*]

Plastic Protective Covers

by Joseph Zelle, W8FAZ

Today many radio parts are being packaged in plastic bags which have been sealed electronically. These small discarded plastic bags can be put to many uses. They are excellent for protecting parts from dust and grime. They are excellent for safekeeping screws, nuts, washers, etc. temporarily, while working on or repairing gear. They are excellent for providing weather-proof covering to rf connectors exposed on roofs, antenna masts, etc. A rubber-band helps to keep the bag closed and fastened in place.

Cut them carefully at one end with side-cutters. Open enough to remove the part enclosed. Keep these bags handy in a nearby bin. Then watch how you will save time by not having to look for strayed accessories! Protected connectors, too, will be clean and untarnished, ready for the next experiment, measurement, or project. ■

Variable Modulation Percentag
for the Heathkit SG-8

Ronald L. Ives
251 Lincoln Avenue
Palo Alto, California

The Heathkit type SG-8 signal generator is an excellent example of a modern general purpose signal generator. The incorporated modulated cathode follower not only gives a low-impedance output so arranged that the loading has negligible effect on the radio frequency output, but also reduces the frequency modulation common to most signal generator designs.

In a number of experimental applications, for which this instrument was not specifically designed, the fixed modulation percentage (about 50) is not entirely satisfactory. For a wide variety of tests involving squelch devices, special detectors, and voice-operated controls, variable modulation would be most desirable. For the testing and setting of overmodulation indicators, load limiters, and splatter suppressors, a greater audio output, permitting overmodulation, would be helpful. Either or both of these changes can be incorporated into the model SG-8 with very little work, at low cost, and without impairing any integral function of the instrument.

Circuit of the SG-8 signal generator is shown in fig 1. The 6C4 triode is the modulator, a is connected as a Colpitts oscillator. AF outp is tapped off the plate (terminal 5) and fed the grid of the cathode follower through a sistive network. When the modulation swi is thrown to "EXT" position (as shown in 1), the 6C4 functions as an AF amplifier, external modulating signal may be introduc at "AF IN" and its amplitude varied by t potentiometer (L, in fig 1). With the modu tion switch at "INT" position, the audio osc lator not only modulates the rf output throu mixing in the cathode follower, but is also cessible and variable through the same pote tiometer (L) at the "AF OUT" terminal.

When the cathode follower is modulated, a no external af load is connected to the sign generator, potentiometer L is without functio This knob, consequently, is available for u as a modulation percentage control through suitable ganging arrangement.

Modulation percentage can be reduced tapping down on the plate resistor of the 6C here 5600 ohms. No stock potentiometer

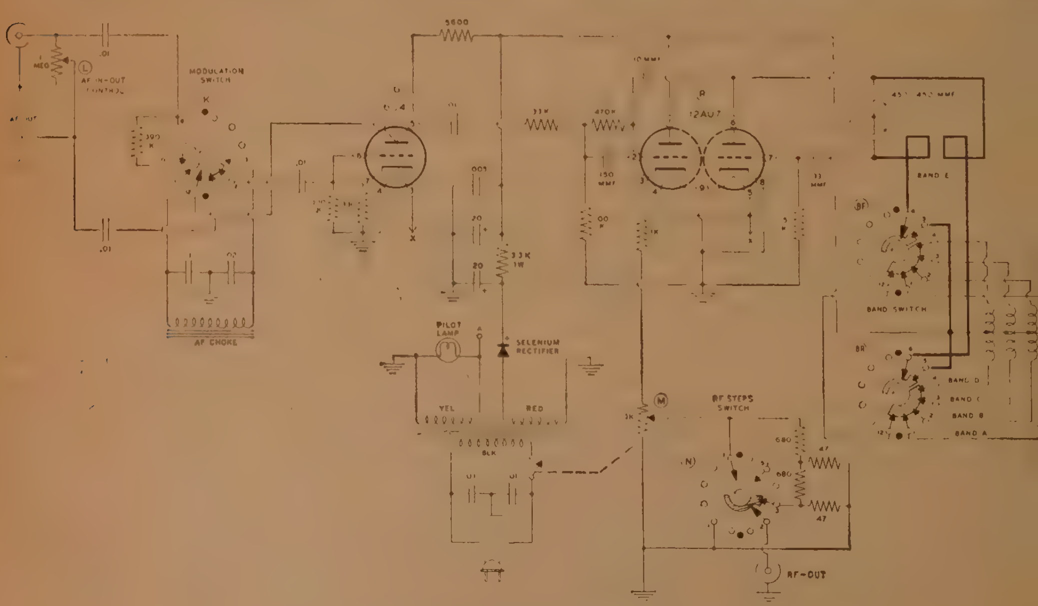


Fig. 1—Circuit of the Heathkit SG-8.

5600 ohms being available, we can shunt a 10,000 ohm pot with a fixed resistor of 15,000 ohms, obtaining a 6,000 ohm variable resistor, which is suitable for this application

Output of the 6C4 audio oscillator is very much greater than is needed to modulate the cathode follower, and must be attenuated to prevent overmodulation. This is done by means of an R-C network in the grid circuit of the output tube. Grid return of the cathode follower is also provided by this network, which additionally functions to prevent bleeding off of the rf to either ground or the modulator circuit. Modulation percentage is most simply increased by using a larger af input condenser (initially 150 mmfd). Optimum value, found by experiment, seems to be about .005 mfd, which permits considerable overmodulation. Slightly more modulation can be obtained by substituting rf chokes for the 100,000 and 33,000 ohm resistors in the network, but this change is not recommended, as it costs about $1.00 per additional percent gain, and makes the circuit resonant, due to distributed capacitance, at one or more frequencies in the operating range of the instrument.

With these facts at hand, it is possible to install variable percentage modulation in the SG-8 by the addition of only three components. These are:—

1—dual potentiometer, 1 megohm and 10,000 ohm sections

1—.005 mf disc ceramic condenser

1—15,000 ohm 1 watt carbon resistor.

Parts "left over" after the change are one 1-megohm potentiometer and one 5600 ohm resistor.

Circuit changes are indicated in fig 2, the added components being shown by heavy lines.

The circuit change can be made quickly and easily in accord with the following instructions. "Heathkit" location designations are used where necessary.

Remove chassis from cabinet.

Remove "AF IN-OUT" knob.

Remove control nut and nickel washer from control L (1 meg. pot.)

Push control shaft back through panel hole, but do not disconnect control leads.

Shorten shaft of dual potentiometer to same length as that of control L.

Insert dual potentiometer (1 megohm and 10,000 ohms) in hole formerly occupied by control L, using same lock washer, nickel washer and control nut sequence as before, and position terminals identically.

Transfer leads from old control to 1 megohm section of new control in identical sequence (S).

Disconnect .01 mfd. lead from G-3 (plate of 6C4), splice on a short lead, insulate it with sleeving, and connect to terminal 2 of 10,000 ohm section of new control (S).

[*Continued on page 175*]

Before modification.

After modification.

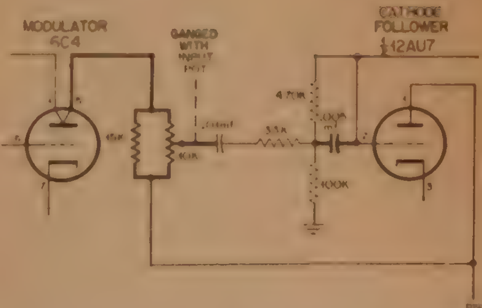


Fig. 2—Necessary circuit changes. The added components are indicated by the heavy lines.

Automation

Bryant Andrews, K2HCB
34 Oak Street
Tenafly, N.J.

If an amateur were to work an average of but one station a day, in all probability he would spend upward of three hundred hours calling CQs in his lifetime. The transmission which replies to an answered CQ is usually standard, that is: report, QTH, and handle. This transmission would be repeated, verbatim, by an active amateur over 15,000 times. I have found a simple solution to this boring repetition for the CW operator. Summed up in one word it is automation, or, a machine to run a machine.

Some 'phone men have been employing tape recorders to call their CQ's for some time. Why not use the same device on CW?

The first problem is how can a key be operated by the sound output of a recorder. However, this problem disappears immediately when it is remembered that the recorded signal is in the form of electrical impulses at the recorder's output. These impulses can quite simply be fed into a relay which in turn keys the transmitter.

A test of the output of the tape recorder here, a *Webcor* 210, showed that the output was just sufficient to drive a discarded telephone relay which had been gathering cobwebs and dead spiders for several years. However, since the relay is DC, and the output from the recorder is naturally AC, a rectifier from the scrap box was inserted. A DPST switch was also added, as shown in the diagram, both to turn off the rectifier filaments and to disconnect the relay from the transmitter if it should stick.

The adjusting of the relay was the hardest part of the entire set up, for the contacts must be far enough apart to avoid arcing, yet close

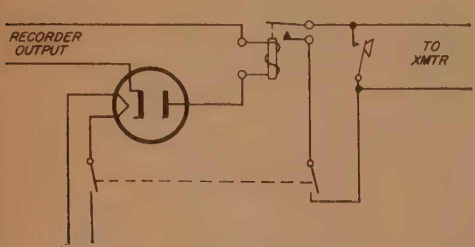


Fig. 1—Automatic keyer circuit. Try a selenium and eliminate the filament wiring.

enough to assure that even the fastest dit w close the circuit. It is also necessary to ha the spring return of the relay tight enough ar the driving signal sufficiently strong to cau the contacts to change position rapidly in or der to suppress key clicks.

Once assured that the unit was functionin properly, I recorded a two minute CQ fo lowed directly by the much repeated transmi sion, leaving a blank for the signal report. Th relay was then wired in parallel with the ke and the rectifier hooked up to the transmitte power supply and my robot keyer was read to go to work.

After starting the recorder and turning o the transmitter, I monitored with the receive and was pleased to find the keying nearly clic free and fully readable. What's more, I ha ample time to fill in the log properly withou being forced to write with one hand whil transmitting with the other.

At the end of the call I stopped the tape an threw the transmitter swiches. To my utte amazement I had an answer, or rather, th robot had an answer. When the caller signed, sent his call by hand and started the tape whic proceeded to send "de K2HCB . . ." and con tinue from there. By the time I had my con tact filled into the log the robot operator wa sending "ur RST. . . ." In the blank I filled i 579 twice. Timing was good and the robo picked up with "hr in Tenafly . . ." while looked up the contact in the call book.

As the tape wound up with the usual "so wa sa om?" I was forced to go to work and fill i the two calls. To my intense joy he returne with "r r, solid copy," obviously completel ignorant of the fact that he had been copyin a machine.

He became very interested when I later ex plained the apparatus, so I went one ste further. I recorded his next transmission an then played it back to him through the rela and my transmitter. Not only was it complete ly copyable, but it gave him an accurate rep resentation of his own keying patterns.

Woe be to the next lid who calls K2HC for he will have an exact taste of his own med icine. In the meantime, the robot operator wi continue to take care of form transmissio while I relax and think up witty sayings for th second go around.

ONE OF THESE DAYS

J. Wesley Sammis, W2YRW
[illegible] S. Woodstock Drive
[illegible]field, New Jersey

"One of these days—POW— To the moon." How many times have we heard this expression used in jest? For those who delve into the realms of electricity, including amateur radio, this remark, in jest, could become a great big reality, in fact way past the moon—**forever.**

Most of you respect voltage, but do you always respect current as much? Chances are you do not. Whether it's current or voltage beware.

A few facts are important to this discussion.

1. The **amount** and **duration** of current flow determines severity of shock, not voltage.[1]
2. **Freeze-on** current is important in all considerations.
3. Under certain conditions, as little as 50 volts can produce freeze-on[2] current.
4. The condition of the outer skin (i.e. dry or wet) is important and affects the amount of body resistance.
5. The **freeze-on** current span is between 15 and 25 ma. (Milliamperes).
6. VENTRICULAR FIBRILLATION can occur between 75 and 100 ma. (This is usually FATAL).
7. The average body resistance (chiefly from the outer skin) can be as high as 90,000 ohms per square cm, when **dry.**
8. The average body resistance (chiefly from the outer skin) can be as low as 900 ohms per square cm when the outer skin is wet due to water or perspiration.
9. The inner skin offers negligible resistance.

The application of ohm's law will show how these facts can be most important. Suppose you get across 75 volts of potential and, at the time, your body resistance is 5,000 ohms. Therefore, ohm's law applies.

$$E = IR \text{ or } I = E/R$$

Substituting

$$I = \frac{75 \text{ Volts}}{5{,}000 \text{ Ohms}}$$

$$= 15 \text{ ma}$$

Referring to #5 above, we find that this is within the range of FREEZE-ON. Unable to release, the current would continue to flow on, the outer skin would blister from burning, the outer resistance drops to almost zero, the current flow would increase, ventricular fibrillation sets in. RESULTS: USUALLY FATAL.

Now don't go putting a volt-ohm meter to yourself to increase body resistance and then sticking your finger on a low voltage power supply, in order to test this theory. It has been done all too many times, by someone who didn't want to do so and who—became a statistic.

Treat your currents and voltages kindly and with respect and you will be around a long time to enjoy your hobby and your friends will enjoy your company.

MAKE THESE YOUR HAM-SAFE CODE[4]

1. GROUND both stationary and portable[5] equipment.
2. Use interlocks to break circuits.
3. Don't wear jewelry, including watches (while working on equipment).
4. Provide warning signs for visitors to the shack and working areas—(for **yourself** too).
5. Test with power OFF, if possible. (How good a technician are you?)
6. **First on—Last off**, should be your grounding rule.
7. If working alone, let someone in the house know about it! A once in a while check could save your life.
8. Know and inform your family on artificial respiration.

To paraphrase the oft quoted commercial—

DON'T BE HALF SAFE—USE CAUTION TO BE SURE—YOU STAY ALIVE. ■

1. Reference Material:
   16 Steps to Safety In Electronics, G. A. Endrich. Safety Maintenance, November 1957, P. 14.
   C. F. Dalziel, E. Ogden and C. E. Abbott, "Effects of Frequency on LET-GO CURRENTS," Transactions AIEE Vol. 62, 1943.
   FIRST AID, American National Red Cross, Fourth Edition Revised 1957.
2. That point where victim loses muscular control and is unable to release his grasp.
3. Changes with individual, his physical condition, etc.
4. The author has a limited supply of these rules on QSL card size for the shack. While the supply lasts, free for the asking with a return, self-addressed envelope.
5. Scopes, signal generators, other such testing devices.

Simplified, Fool-proof Screen-grid Modulation

Wm. S. Skeen, W7EPM/6
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Redwood City, California

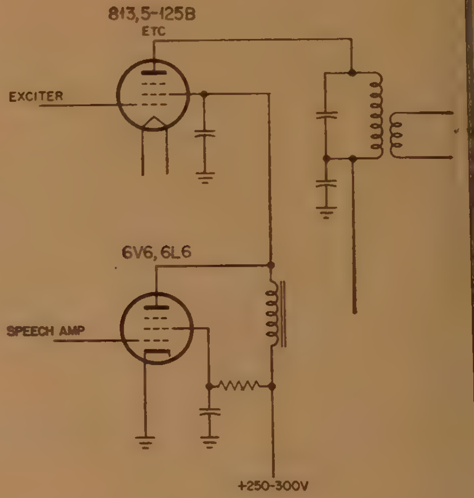
Screen-grid modulation—with the exception of clamp tube systems—has always enjoyed a rather poor reputation, deservedly so, in many cases. Transformers which will match the impedances encountered are quite often not available, and attempts to approach 100% modulation usually result in objectionable distortion. The system described here avoids these two most serious drawbacks, while offering many advantages in addition to surprisingly good audio quality. Nothing unique or revolutionary is involved. It may be simply described as paralleling the modulator plate with the screen-grid of the final r-f amplifier. with the common d-c supply fed through an ordinary filter choke. More simply yet, Heising screen-grid modulation!

Probably the chief advantage of this type modulation is that it "sounds good" regardless of operating conditions. While modulation percentage will vary, no distortion results from wide variations in r.f. excitation, bias, or plate loading. This is not too surprising when we remember that Heising systems are incapable of reducing to zero, or cutting off the carrier, thus eliminating the chief cause of "splatter."

The average filter choke has enough self-capacitance to by-pass the higher audio frequencies. Besides restricting the width of the sidebands to the useful speech frequencies, other advantages ensue. The modulator may be overdriven, so as to produce clipping action. Ordinarily, it would be necessary to provide a filter to avoid excessive harmonic distortion, but the choke does its own filtering, and the corners of the square waves are nicely rounded, in the modulation envelope. We thus have the high "talk power" of clipper-filter systems, without the associated circuitry.

Observation on a scope reveals that the modulation peaks remain substantially constant, regardless of carrier level. The carrier may be reduced to quite low levels, leaving the positive peaks considerably more than twice the carrier level, with total sideband power better than the 50% obtained with 100% modulation. No distortion results, since the carrier never reaches cutoff.

As a single 813, or alternatively a 5-125B is used at this station, discussion of operating conditions will be limited to tubes of this



class. The system is of course applicable to other tetrodes or pentodes, with the exception of the newer oxide cathode types, where reverse screen current is often encountered. At this point, it may be wise to mention that the use of a fixed screen supply is pre-supposed. A screen dropping resistor of proper size with a large filter condenser might work but is not advised.

With 1500-2000 V on the plate of an 813 excitation should be reduced for a plate current of about 100 ma. While not essential, the grid bias may also be reduced to between 100 & 120 V. Plate loading should be adjusted for 4 to 5 ma. of screen current. More than this will result in rapidly decreasing modulation percentage. Screen current will commonly swing up to 7 or 8 ma. on peaks. With 250-300V for the modulator plate and final screen-grid, ample modulation will be obtained with a pentode, such as a 6V6 or 6L6.

Under these conditions, the final will be operating at about 40% efficiency, and the 125 watt dissipation of the tube will not be exceeded. The carrier may be reduced even further, as mentioned previously, with a resultant increase in modulation percentage, but whether less carrier with increased modulation is better than more carrier with less modulation is a question that could lead to considerable discussion. In any event, I have used

[*continued on page* 175]

ANOTHER Set of Rules

J. D. Heumphreus, K6DXW
3819 Sunset Road #4

"**What-dya-mean, I'm violating** an ordinance? Listen, I've got an FCC license, and this is none of your darn business!" It is doubtful that this will ever happen, but in addition to Federal licensing and operating requirements, there is another set of rules that have the amateur operator in mind. At present, the enforcement of these rules is not very strict; nevertheless it is well that we have a knowledge of them.

What are these other rules, and why do they affect us? These regulations are the group of articles known to electrical contractors and inspectors as the National Electrical Code. This code is the standard of the National Board of Fire Underwriters and applies to all electrical wiring and apparatus as recommended by the National Fire Protective Association. Now comes the catch: this code is incorporated into most county and city electrical ordinances either entirely or by reference.

The section of the code which we, as amateurs, are concerned with is Article 810. This article states in part: "This article shall apply to radio and television receiving equipment and to amateur transmitting equipment." That means us, gang. Let's take a look at this portion of the code and see what it has to say. We're not likely to be pinched or called on the carpet if we don't conform to the specifications of the code, but most of the rules are good safety and operating practices anyway.

Antenna Systems

The code requires antenna and lead-in wires to be of high strength, corrosion resistant material, such as hard copper, aluminum, or copper-clad steel. It does allow use of soft- or medium-drawn copper for lead-in where the maximum span is less than 35 feet. The antenna must be of at least 14 gauge where the maximum span is les than 150 feet. If the maximum span is over 150 feet, 12 gauge is required. The code further specifies that antenna wires not be attached to poles or structures carrying wires with voltages in excess of 250 volts. If attached to metal structures, the structures must be permanently and effectively grounded. Each conductor of a lead-in must be provided with a lightning arrestor, except that in the case of co-ax cable, if the outer shield is permanently grounded, no arrestor is needed.

Grounds

We have already encountered a favorite saying of the Underwriters: "permanently and effectively grounded". "Permanent" means just that. A length of cable is not permanently grounded just because it is attached to a grounded transmitter or antenna tuner. The ground must be attached directly to the cable sheath. Lightning arrestors are also protection against fallen power lines coming in contact with an antenna, or against a transmitting antenna sagging and contacting a receiving antenna. "Effectively grounded" is a bit more involved. This refers to the code article on grounding, a topic all in itself. Let's see how this applies to ham transmitters.

Grounds are divided into two groups; protective and operating. The protective ground is the ground return from the lightning arrestor, and must be as large as the lead-in wire. It should be run to ground in as direct a line as possible. The operating ground is the ground for the equipment. This is the ground we miss when we find a few volts difference between the mike and the receiver. This can be a bit painful if we happen to have our hands on the receiver and get the mike too close to our lips. This ground must be of at least 14 gauge or equal. ⅛" tinned braid has the same area as #14 wire; personally I like to use ⅜ or ½ inch braid. The grounding conductor should be run to ground in as short a length as possible. It need not be insulated wire, but should be covered where subject to possible mechanical injury. It may be tacked to the supporting surfaces. It should be connected to a water system where possible, or to a grounding electrode if water pipes are not handy. Some amateurs have found that a ground wire buried a few inches under the ground directly under the transmitting antenna has considerably improved low frequency operation, especially in dry areas.

A new device has recently appeared on the

[*Continued on page 171*]

Ye Old Timer Quiz

Rockaway Valley Radio Club

TRUE or FALSE

T F

1. The potential at any point is the work done on a unit positive test charge in bringing it from infinity to the point in question. — —
2. Since a radio amateur license is a federal document, it is illegal to photograph it, or make photostats, photocopies or duplicate it by any means, or have such a duplicate in your possession. — —
3. In a conductor of virtually zero resistance that has a direct current flowing through it, the electrons travel at the speed of light approximately 186,000 miles per second. — —
4. The energy represented by an electron moving through a difference of potential of one volt is called an electron-volt. — —
5. The theoretical impedance at the base of a ¼ wave whip mounted on the rear deck of an auto is 36 ohms (or very close to it.) — —
6. A battery can be likened to an electron pump which produces a surplus of electrons at its negative terminal and a deficiency of electrons at its positive terminal. — —
7. The cross-section of a wire in circular mils is the square of the diameter in mils. — —
8. –40°C equals –40°F — —
9. A circuit has an inductance of 1 henry if a constant current of 1 ampere maintains an induced emf of one volt in it. — —
10. If a pure resistor, a pure capacitor and a pure inductor are connected in parallel the "Q" of the combination is given by $Q=\frac{WL}{R}$ where $W=\frac{I}{\sqrt{LC}}$ — —
11. Persons holding a valid "Restricted Radiotelephone Operators Permit" (3rd class) may operate a properly licensed Amateur Radio Station provided a currently licensed Amateur is standing by. — —
12. It is illegal for a properly licensed person to operate a properly licensed mobile amateur radio station without having a properly functioning device within the car that can give an indication in the event of a Conelrad Radio Alert. — —
13. If you own a properly licensed Amateur Station you may legally destroy it if you wish, without surrendering your license privilege. — —
14. If you operate a properly licensed walkie-talkie in an open convertible which is on a ferry boat in a harbor you must identify yourself as "Portable-Mobile-Maritime-Mobile." — —
15. If you anticipate mobile operation during a vacation trip away from home in excess of 48 hours you must give prior written notice to the Engineer in Charge of the radio inspection district *in which such* mobile operation is *intended*. — —
16. The property of an inductor is to oppose the change of current. — —
17. Joules=Newtons x meters — —
18. Our nearest star Alpha in Centaur group is about 3½ light-years distant. (This isn't electronics but you must admit it's interesting.) — —
19. The phase velocity of wave fronts often exceeds the speed of light. — —
20. The speed of electrical energy in a coaxial transmission of RG58/AU (72) is about 2/3 that of the speed of light, therefore the electrical length of a ¼ wave transmission line should be about .66 that of a ¼ wave antenna. — —
21. $Ae^{J\theta} = A \angle \Theta = A \sin \Theta + JA \cos \Theta$. — —
22. As far as a receiver is concerned, there is no difference between a frequency modulated signal (FM) and a phase modulated signal (PM) if both are modulated by the same complex (voice or music) audio. — —

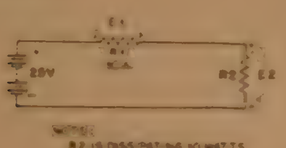
In the following questions the carrier powers are equals.

23. Based on a comparison of *Signal* to *Noise* a 100% modulated SSB signal with completely suppressed carrier will be 8 times more effective than a 100% modulated conventional DSB (AM) signal.
24. Based on a comparison of *Signal* to *Noise*, a phase modulated signal with a modulation index of 5 will be 25 times more effective than a 100% modulated conventional DSB (AM) signal.
25. Based on a comparison of *Signal* to *Noise* a frequency modulated signal with a deviation ratio of 5 will be 75 times more effective than a 100% modulated conventional DSB (AM) signal.

Computations

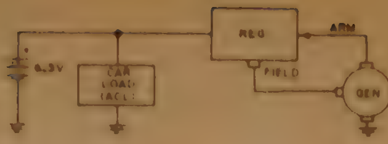
1. What is the effective resistance of this combination in ohms?

2. What is the current flowing in this circuit in amperes?

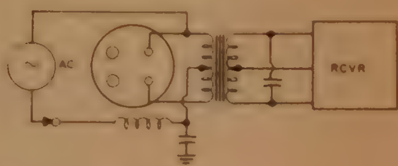


3. A radar operator flying in a high speed jet parallel to a straight run of high tension towers notices that the number of blips he sees every 225 seconds is numerically equal to the speed of the jet in miles per hour. How far apart are the towers? (in feet)
4. What is the name given to this type of antenna?

5. Below is a block diagram of a typical automotive electrical system. As the battery approaches full charge, does the internal resistance of the battery increase or decrease as far as the *generator* is concerned. Assume normal regulator action and constant speed and constant external load.



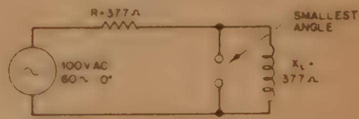
6. If in the afore question the regulator was omitted and the field terminal grounded, would the generator armature current increase or decrease as the battery becomes charged?
7. If a 115 CPS NON-SYNCHRONOUS vibrator of a 6.6 volt D.C. typical auto radio is removed and a 60 CPS AC voltage is applied as shown below what should be the value of the AC voltage applied in order to obtain normal B+?



Approximate

(a) 13.2v	(d) 4.9v
(b) 6.6v	(e) 3.3v
(c) 6.3v	(f) 3.0v

8. Is the voltage leading or lagging the current in the circuit below?



9. When a capacitor is discharging through a resistance, the time constant is the time in seconds that it takes for the capacitor to:
   (a) lose 63 per cent of its voltage
   (b) lose 37 per cent of its voltage
   (c) discharge to zero
   (d) discharge to a voltage given by the original starting voltage divided by RC
   (e) discharge to a voltage given by the original starting voltage divided by 5RC
10. In a properly operating class "C" amplifier which is modulated 100% by a single sine wave tone, the maximum instantaneous peak power in the envelope is:
    (a) same as carrier power
    (b) twice carrier power
    (c) four times carrier power
    (d) eight times carrier power

For correct answers meander on over to page 189.

The Complete Remote Control

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Foreword:
The remote control system for a complete amateur station described in this article, while it probably will not be duplicated by too many amateurs, may be the inspiration for many amateurs to improve their operating locations. The application of remote control to amateur radio can bring more satisfying operation to a ham using a poor location or living in an area where extensive antenna systems are prohibited by ordinance or zoning laws. A small plot of ground undesirable for other uses could become an excellent station location. A small building, built by the ham himself, requiring no heat or utilities except for electric power and large enough for the necessary equipment, is all that is required. The monthly telephone line charge per mile will vary in different parts of the country but $3.00 should be close to average.

Operating an amateur radio station in today crowded bands, whether it be for DX-ing, tra fic handling, or rag-chewing, can be a grea deal more satisfying if the operating locatio approaches the ideal. The desired site shoul be sizeable in area, clear of large surroun ing objects, offer low susceptability to TV and most important of all—suffer as little possible from man-made noise and interferenc

By contrast to the above, with the exceptio of a coal mine interior, the poorest operatin location used by amateurs today is perhaps the downtown office and store building sectio in a large city. The level of man-made inte ference and signal absorbtion of this type location limits contacts to only the stronge signals on any band and relegates dx contac to the limbo of all forgotten things!

If we designate an operating location mee ing, as nearly as possible, the ideal requi

ments above as A, and the poorest location as B—it would not require a Sherlock Holmes to deduce that, if operation from a B location is a necessity, one solution would be to operate equipment located at A from B. . . . elementary my dear Watson.

This was the problem, the reasoning, and the solution behind the successful design and construction of the remote control system for WØDYG. The operating location is in an office on the eighth floor of a downtown office building in the heart of the Omaha business district. The transmitter site available was the radio station KOWH transmitter site located approximately six miles northwest of downtown Omaha. With the exception of the 500 foot high broadcast tower used on 660 kc and the incoming high voltage transmission line, there are no high obstructions. The roof of the transmitter building located near the center of the forty acre site was available for the erection of antennas.

The first method of remote control used one channel of the twenty available in the Schafer Remote Control System employed by radio station KOWH. This method had serious drawbacks however, since the meter readings of the broadcast transmitter at regular intervals would result in loss of control of the amateur transmitter, and if the operator neglected to return the equipment to channel four, the loss of control was of a semi-permanent nature. This system too, only solved a portion of the problem of operation from a poor location since only the transmitter was remotely located. It was like one lick on a candy sucker, one always wants more . . . so the control requirements were listed and evaluated and this article describes the equipment designed and constructed to fulfill them.

The desired functions of the control system were as follows:

1. Control of main ac, both ON and OFF.
2. Control transmitter carrier, both ON and OFF.
3. Change transmitter frequency within the band.
4. Tune the receiver.
5. Rotate the directional antenna arrays.
6. Indicate direction of the antenna arrays.
7. Change band of operation.
8. Only one telephone line to be used.

Of the eight requirements listed, only number seven was discarded as being impractical. However, band changing is possible and one method of its accomplishment will be outlined at the conclusion of the article.

Additional requirements were decided upon for the remote control operating unit at the operating position as follows:

1. Unit to be small and compact but not miniaturized.
2. Unit to present an appearance compatible with the general furnishing of the office.
3. Unit to have a telephone patch available with automatic changeover from send to receive.

These requirements were added to the functions already decided upon and the equipment in the photographs and drawings was constructed and placed in operation.

Remote Control Operating Unit

The remote control operating unit is shown in the photos and in figs. 1 and 2. The unit is divided into five separate sections although they are all interdependent and form the complete operating position. They are the microphone line amplifier, the receiving audio amplifier, power supplies and associated switching, telephone patch, and the indicating meter circuits. These will be described and discussed when necessary, in the order given.

Physically, the remote control unit shown in the photos is of "drawer" type construction, using an inverted 17x10x4 aluminum chassis. The amplifiers are constructed on the back with the tubes and transformers extending toward the rear of the cabinet. A vertical shelf located about midway across the chassis contains all power supplies, adjusting pots, and relay *K3*. The front panel contains the two pilot lights, concentric volume controls, key switches *S1* through *S4*, and the 50 microampere meter. The chassis is mounted on full suspension drawer hardware for easy removal and access. After disconnecting the ac, speaker, and telephone line, the drawer assembly may be lifted clear of the sliding supports and removed. The panel above the control unit contains a Fisher AM-80 hi-fi broadcast tuner and a 4 x 6 oval speaker. The hi-fi amplifier used with the tuner together with a speaker selector switch are in the cabinet below. Beside the cabinet containing the remote control unit is the Hallicrafters SX-71 receiver used as an off air monitor as required by the FCC.

The remote control unit in its withdrawn position for adjustment. The unit will lift clear of the tracks for complete removal.

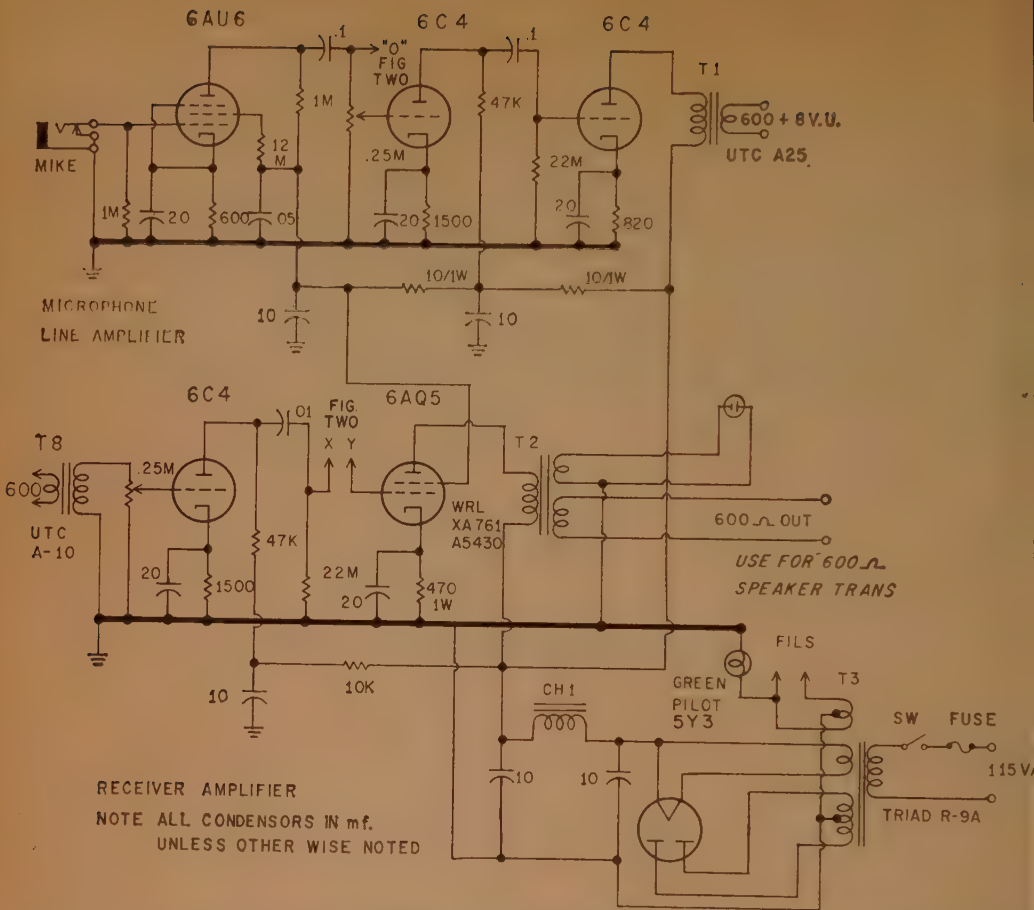


Fig. 1—Both volume controls in the receiver amplifier are mounted concentrically with the power switch on the rear. This unit shares the remote control chassis with Fig. 2.

The purpose of the microphone line amplifier is to raise the output level of the microphone to a level of plus eight VU for transmission via the telephone line to the transmitter. The circuit is more or less standard, using a 6AU6, 6C4, 6C4, with a high impedance input for crystal or dynamic microphones, and a 600 ohm output impedance.

The receiving audio amplifier serves to increase the incoming line level from the remotely located receiver to that sufficient for loud speaker operation. A relatively low gain amplifier accomplishes this purpose as shown in fig. 1, using a 6C4 and 6AQ5. The amplifier has output impedances of 600 and 8 ohms.

A common power supply is utilized for both amplifiers and uses a 5Y3GT full wave rectifier with condenser input filter system. Adequate decoupling is provided by the liberal use of ten-thousand ohm resistor and ten mfd condenser combinations.

Since the voltages for relay operation at the transmitter must be available in various combinations, including polarity reversal, thr separate supplies are required. Two of tl supplies are identical, using a 24 volt filame transformer, bridge connected selenium rect fiers, and single condenser filter. The thi supply is identical except for the addition a filter choke and additional filter condense followed by a retard coil or audio choke. Tl purpose of this audio choke is to prevent tl low impedance of the output filter condens appearing across the output of the micropho line amplifier and destroying its response. Eac power supply has an output voltage adjusti pot and a metering jack for measuring loa current. The current taken from the suppli is tabulated in the function chart for the o erating remote control unit and is shown Chart I, on page 66.

Control Methods

Before discussing the actual switching ci cuitry in the unit, a brief explanation of tl

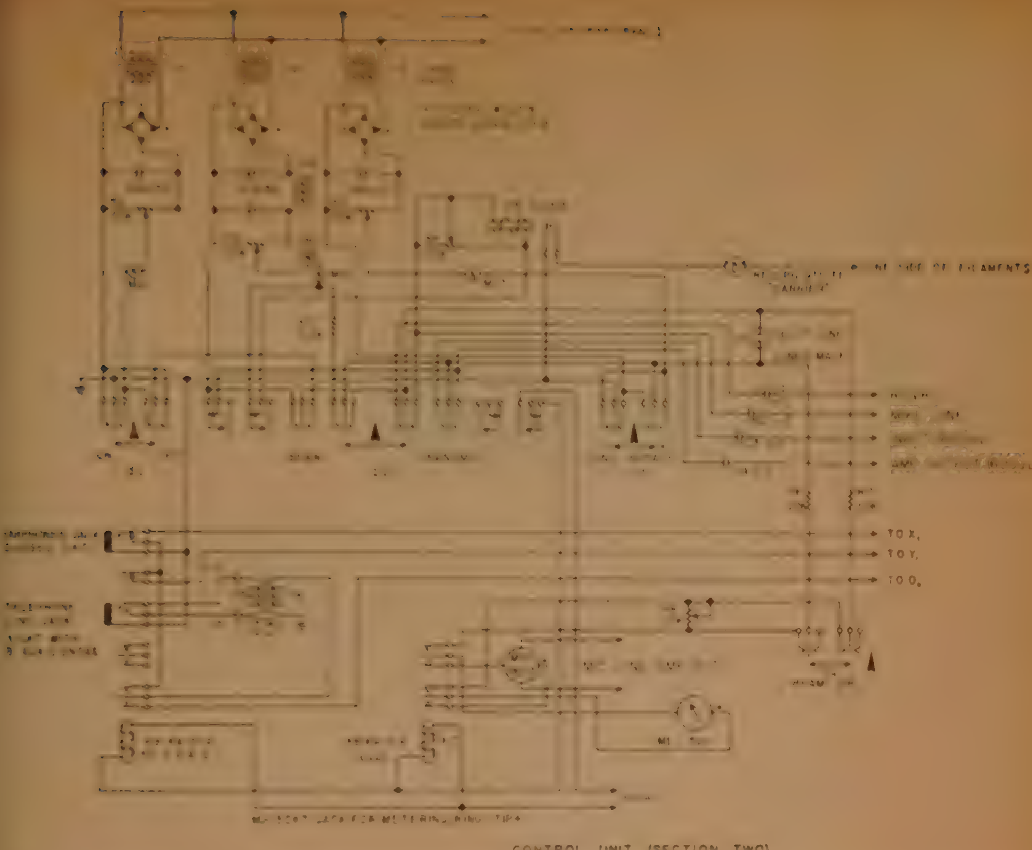


Fig. 2—Schematic of the second section of the remote control unit. Letters X, Y and O at lower right side of drawing are to be connected to similarly designated points in Fig. 1.

method of control is in order. In the full use of a single telephone line, consisting of two physical wires from one point to another, we actually have three dc paths available. They are between the two wires of the pair and from each wire of the pair to ground. These three dc paths will give us three functions. It is readily apparent that if polarity reversal is used in conjunction with polarized relays we immediately double the available functions to six.

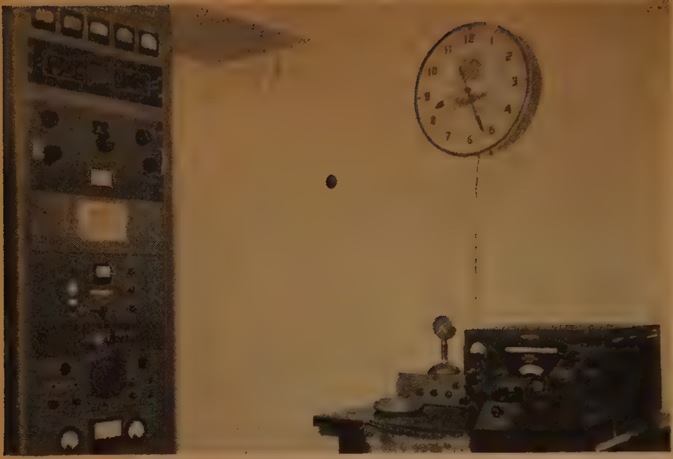
Before continuing, the definition of a function, in relation to relay systems, is a physical movement or electrical change in one direction only. In other words ON is one function and OFF is another, etc.

One method of securing additional functions is to sacrifice one function from actual operation and use it to change two available functions to other uses. This procedure furnishes a net gain of one function. Another method of gaining functions in simple relay systems is to utilize time delay relays to change an available function to another use after a definite passage of time.

Other methods of increasing functions are available including using a suitable pulsing dial and stepping relays resulting in a gain of from ten to forty-four functions. The conclusion however, is reached that even the most simple system of remote control can be allowed to grow overly complex for the job required of it. It is therefore imperative that we "say when", or the equipment is in danger of becoming too involved for simple and reliable operation and may therefore jeopardize the pleasure and advantages of operating by remote control.

The switching system at the remote control operating unit, shown in fig. 2, is comparatively simple and a brief description should suffice. All control switching is accomplished by three key switches, S1, S2, and S3. In the following description L1 and L2 refer to respective sides of the telephone line.

Switch S1 in the ON position applies a positive voltage between L1 and ground and through the use of time delay relays at the transmitter unit becomes the frequency change



Overall view of the transmitter and local operating position.

function. Switch S1 in the OFF postion applies a negative voltage between L1 and ground.

Switch S2 is a standard telephone type key switch and the particular one used is a Western Electric 479JR. This key switch was used simply because it happened to be on hand and any equivalent key may be used providing its contact pileup is adequate. One readily available substitute would be a Switchcraft Telever 60324L which has four form C contacts actuated on each side of the center position.

In the **Transmit** position, S2 applies positive voltage to L1 and negative to L2. Simultaneously it connects the output of the microphone line amplifier to the telephone line via the two 1.0 mfd audio coupling condensers which isolate the transformer secondary from the relay operate voltage; it disconnects the telephone line from the input of the receiving amplifier; and operates the telephone patch and meter relays through an additional set of contacts. The operation of these relays will be discussed later. The carrier pilot light relay, K3, is operated by the line current, when in the **Transmit** position, and is adjusted to just pull in by means of R4 in shunt with its coil.

In the **Beam** postion of S2, positive voltage is applied to L2 and negative to L1. The 3.3k resistor in series with positive from the power supply is to hold the line current to the same approximate values as that resulting when the carrier pilot light relay is operated in the **Transmit** position.

Switch S3 in the **Minus** position, applies a negative voltage between L2 and ground, and causes the receiver to be tuned lower in frequency, or the beam antennas to be rotated counter clockwise, depending on the position of S2. Switch S3 in the **Plus** position applies a positive voltage between L2 and ground, performing the reverse functions of those for the **Plus** position. Switch S1 and S3 are both Switchcraft 3037 lever switches.

The telephone patch relay in the de-energized position connects the headphone output of the receiving amplifier to the high impedar winding of T4, a Triad A9J line to grid tra former. The line winding of T4 is connected the telephone line jack through two 0.5 n coupling condensers. In the **Transmit** positi of S2, K1 is energized, transferring the hi impedance winding of T4 to the high side the microphone line amplifier volume contr When using the telephone patch, operation completely by the telephone instrument a the local microphone is not used. The lo speaker is muted by virtue of the open gr connection to 6AQ5 to prevent acoustic fee back.

Relay K2 in the de-energized position co nects the meter, when S4 is closed, throu R6 and R7 to the telephone line. The met is adjusted by means of the shunt potenti meter, R8, to coincide with the selsyn directic reading at the transmitter. Switch S4 is nece sary so that beam direction will be read on during the time S1, S2, and S3 are not operate Operation of S1, S2, or S3 to any positio when S4 is closed, will pin the meter in or direction or the other. While the meter ma not be permanently damaged, it is not tl best treatment in the world for a 50 micr ampere meter. Judicious use of S4 will preve this occurrence.

This completes the description of the remo control operating unit and we now travel ov the more than six miles of telephone line the equipment we are controlling and see wh these voltages of different polarity do to a complish their mission.

Transmitter Control Units

Control is applied to a kilowatt transmitt operable on all amateur bands, eighty throu ten meters. Details of the transmitter will n be given here but a brief description of tl major units follows so the reader may mo easily visualize the installation.

At the top of the rack is the antenna chang

over relay, plate voltage meter multiplier, and B & W low pass filter. The top panel is the metering panel for the power amplifier and contains the grid current, screen current, cathode current, plate voltage, and power output meters. Next is a Millen three inch oscilloscope for modulation monitoring. Below the 'scope is the band switching power amplifier using a pair of Amperex 6156 4-250A's with pi-network tank circuit tuned by a vacuum variable condenser. The cooling blower is behind the blank panel immediately below the amplifier.

The exciter is a World Radio Laboratories Globe Chief with the crystal changing unit mounted immediately below. The panel with the I-82-B selsyn indicator and switches for local control is the main relay unit. The auxiliary relay unit and beam rotator control relays are behind the panel containing the pa filament voltmeter, volume unit meter, and dc voltmeter for the local calibration of the dc beam direction indicating system. Below the relay units is the pa grid bias and screen voltage unit. The unit in the bottom of the rack is a 3000 cycle low pass filter and a pair of parallel connected 836 tubes in a high level clipper. Modulated high voltage is obtained from a separate unit using a pair of 833A's in Class B.

A sixteen hundred watt fifty ohm dummy antenna is available for testing the ham transmitter. It is made up of ten 500 ohm, 160 watt, non-inductive Ohmite resistors mounted in a shielded enclosure together with a 0-8 rf ammeter.

All cabling to the local operating table is through a one inch conduit terminated in a surface mounted wall box. In addition to the Collins 75-A4 receiver, a hi-fi ten-watt amplifier and local carrier control are on the table. The amplifier serves to raise the incoming line level to that required at the modulator driver input and also as the local microphone preamplifier. A level of plus 12 VU is required to drive the modulator.

Remote Control Relay Units

The remote control equipment at the transmitter is constructed in various units, designated main relay, auxiliary relay, crystal changing, beam control, and ac control. This construction assembly would not be recommended for duplication, the construction of the system by units being brought about by the desire to maintain operation throughout the various stages of construction. The units could therefore be most easily combined into one integrated unit for connection to any transmitter.

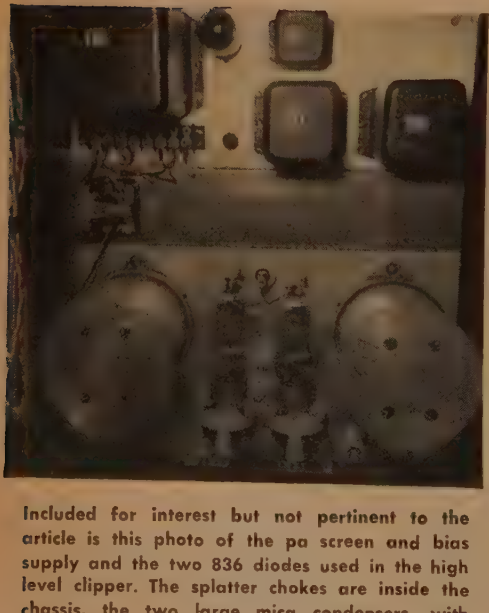
Physically, all relay units are mounted on Bud "bathtub" chassis of various sizes catalogued as CB-1371 through CB-1377. Several of the smaller units have been bolted together so the removal of a front panel will not let a chassis become loose.

Referring to figs. 3, 4 and 5 throughout the following description, the functions will be discussed in as nearly their operating order as possible.

ON Function: The postive voltage arriving between L1 and ground energizes relay K3 because of conduction of D3, a 1N34A crystal diode. Its contacts energize the ON coil of the latching relay K8. The contacts of K8 turn on all modulator and hv rectifier filaments and also energize relay K16. The contacts of K16 furnish ac power to the outlet strip in the rack furnishing power to all other units. All ac switching is acomplished in the hot side of the ac supply line, the ground side being uncontrolled. Two seconds following the application of ac power, the contacts of relay K13 and K14 transfer the contacts of relay K3 to the crystal changing solenoid, K18. After this occurs, further operation of the On key will step K18 through the six crystals available. It will be noted in examining the K18 circuit that the first crystal change step actuates the exciter unit. This is done so the receiver can be tuned

The Collins 75A-4 receiver showing the tuning motor in place and ready for remote operation. The two push button switches are for local motor testing. The speed control rheostat was disconnected after installation of a vernier drive unit between the motor and the receiver dial. The hi-fi amplifier used for speech input is shown to the left of the receiver. Local carrier control, in parallel with that on the transmitter control panel, is mounted atop the ampifier and is out of sight behind the receiver.

The panel containing the I-82-B selsyn indicator is the local transmitter control panel and immediately above is the crystal changing panel with 300 ohm ribbon to the World Radio Laboratories Globe Chief used as the exciter.



Included for interest but not pertinent to the article is this photo of the pa screen and bias supply and the two 836 diodes used in the high level clipper. The splatter chokes are inside the chassis, the two large mica condensers, with them, are a part of the 3000 cycle low pass filter.

to the operating frequency and makes it p[ossible] to more easily visualize the receiver tu[ning] from the remote control point. The next cry[stal] change step turns off the exciter but rem[ains] on the crystal just selected. The solenoid K18 operates on about 100 volts, provided [by] selenium rectifier SR1, and its shaft [ro]tates in 30° steps. The two switch wafers [are] single pole 12 position, connected to perf[orm] as described.

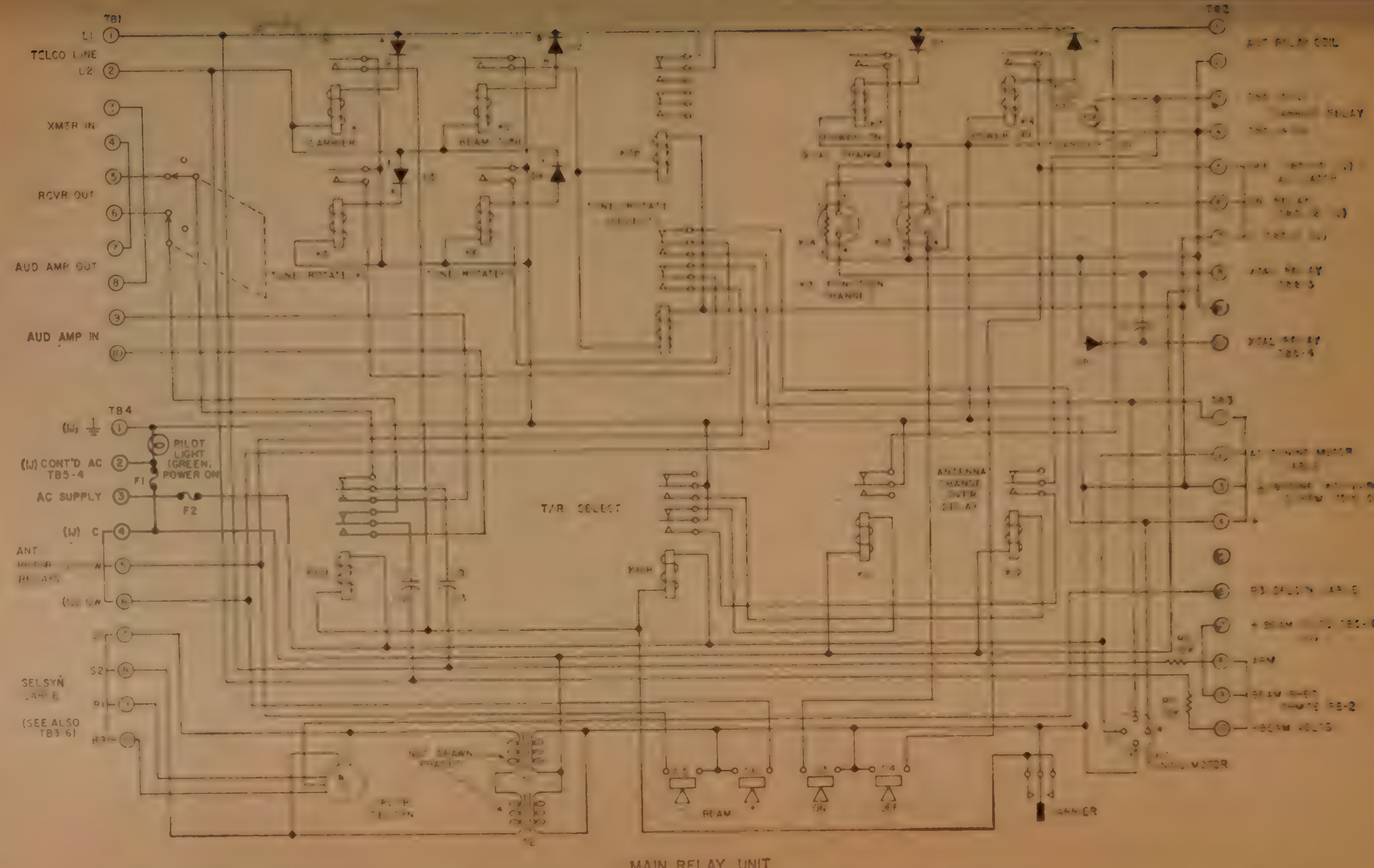
Off Function: A negative voltage arriv[ing] between L1 and ground energizes relay [K1] through D4, and its contacts energize the coil of K8, shutting down all ac to the tra[ns]mitter.

Tune Function: The voltage arriving [be]tween L2 and ground will energize either re[lay] K5 or K6, depending on polarity. The cont[acts] of K5 and K6 control the tuning motor throu[gh] the back contacts of relay K7A, the Tu[ne] Rotate select relay, when it is de-energiz[ed]. The tuning motor is a Bodine Type KCI-22[...] and through its self-contained gear train [de]velops 75 inch ounces of torque at a sh[aft] speed of 5.7 rpm.

Beam-Rotate Function: Voltage arriv[ing] across the line with L2 positive energizes re[lay] K2, its contacts then energize relays K7A a[nd] K7B. Relay K7A transfers the contacts [of] relays K5 and K6 to the beam rotation rel[ays] K19 through K22, and the beam may then [be] rotated by operating S3 at the control u[nit]. K7B opens L1 so that it is disconnected fr[om] relays K3 and K4. This is necessary to preve[nt] their operation during rotation of the bea[m]. This would occur since during the beam ro[ta]tion functions, voltage is applied both acr[oss] the line and from L2 to ground. In the **P[...]** direction the two voltages add and would o[p]erate relay K3, resulting in a change in f[re]quency.

Transmit Function: Voltage arriving acr[oss] the line with L1 positive energizes relay K[...] its contacts energizing relays K10A and K10[B]. Relay K10A disconnects the receiver from t[he] telephone line and connects the input of t[he] transmitter line amplifier in its place. T[he] telephone line is isolated from both equipme[nt] by C2 and C3. Relay K10B operates rela[ys] K11 and K12, both Agastat pneumatic ti[me] delay relays, which in turn provide prop[er] sequence operation of carrier relay K9 a[nd] antenna changeover relay K17. The switchi[ng] sequence is such to delay application of t[he] carrier until one-half second after operati[on] of the antenna relay. When relay K10B r[e]leases, the carrier is removed, followed [by] one-half second by transfer of the antenna ba[ck] to the receiver. This circuitry was provided [to] protect the antenna relay contacts when ha[n]dling high power.

Two directional indicating systems a[re] mounted on the antenna tower. An I-82[-B] selsyn indicator and its associated selsyn tra[n...]



MAIN RELAY UNIT

Fig. 3—Schematic of the main relay unit. The designation (IJ) at the terminal board indicates internal jumpers between units. The letter designations at the selenium rectifiers indicate Vector Turret terminals.

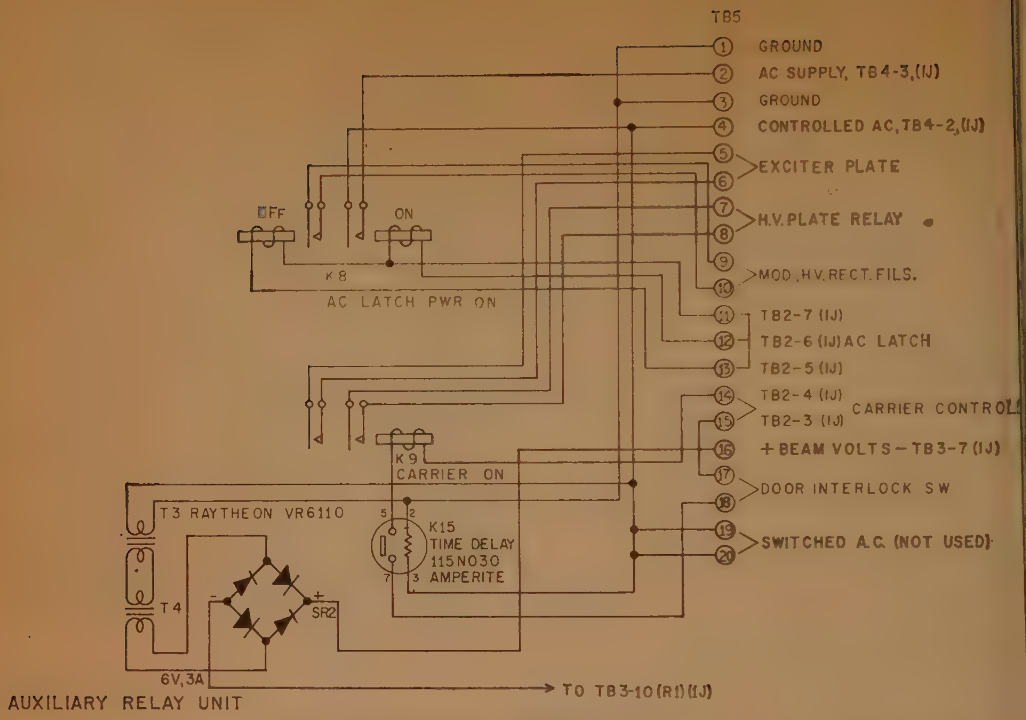
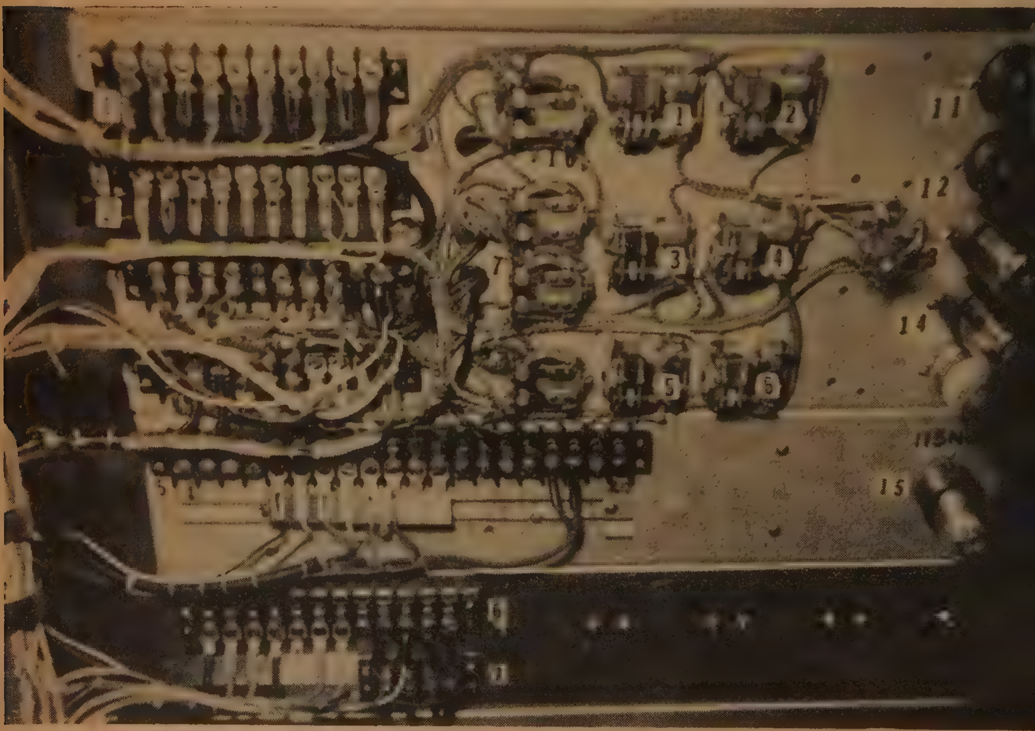


Fig. 4—Circuit of the Auxiliary Relay Unit.



This rear view of the relay panels shows the mounting of some of the relays. The rear mounting provides easy access for maintenance while relays requiring less servicing are mounted inside the bathtub chassis. Relays 11 and 12 were originally Amperite vacuum types and were replaced by Agastat units mounted on the side of the rack and connected with adaptor cables.

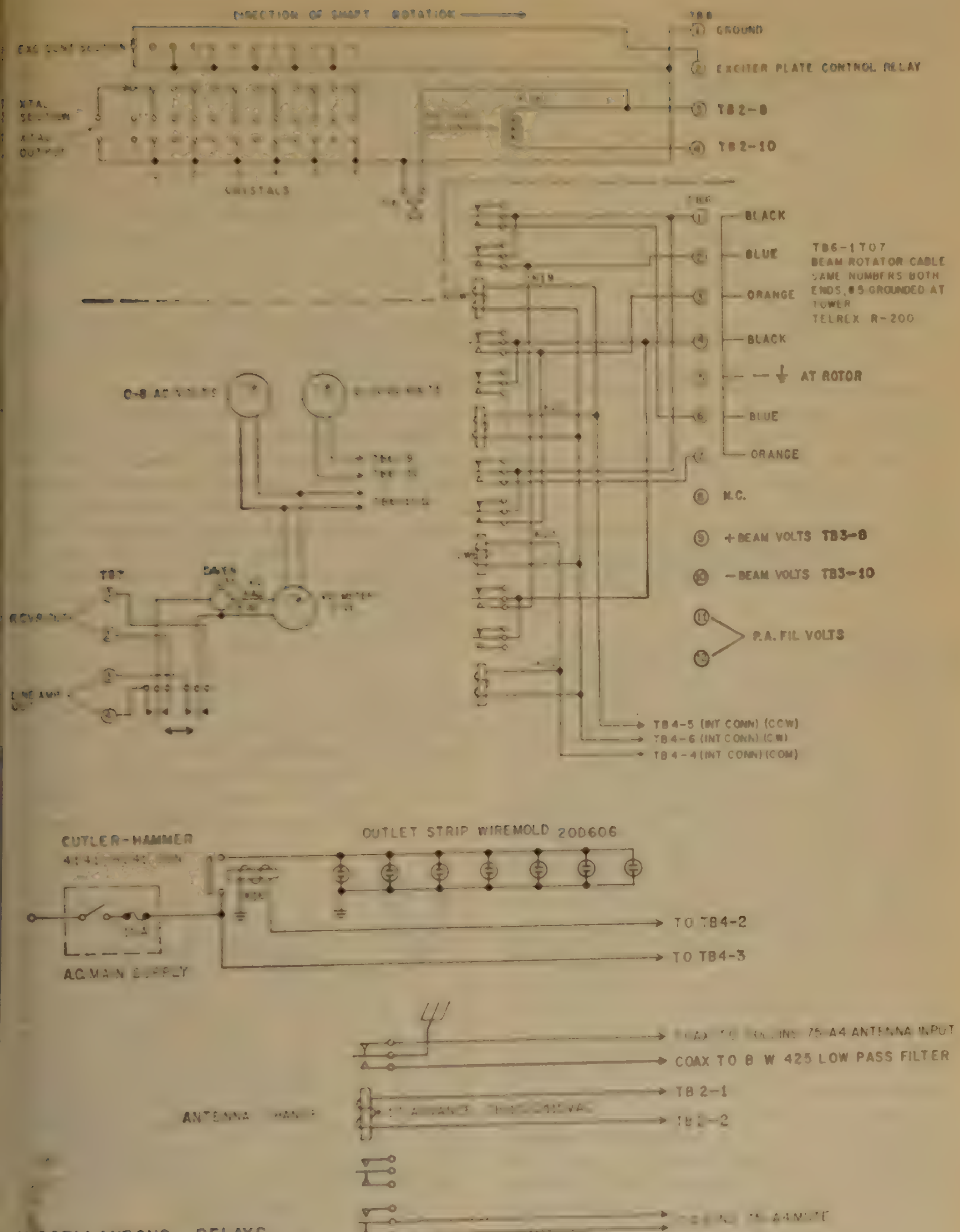


Fig. 5—Schematics of the crystal changer, beam control unit, miscellaneous meter and relay units.

mitter is used for local operation and for calibration of the dc system. The dc system utilizes an Ohmite RB-2 beam direction rheostat, with the resultant voltage impressed into the center of the telephone line through R1 and R2. Fig. 6 is simplified schematic of the remote direction indicating system. The maximum current available for remote reading is approximately fifty-five microamperes when the low voltage power supply is adjusted for an output of seven volts. At first glance it would appear that a great deal more indicating current would

Switch	Position	Current MJ1	MJ2	MJ3
S1	ON	2.0		
S1	OFF	2.0		
S2	TRANSMIT		2.6	
S2	BEAM		2.5	
S3	MINUS			1.8
S3	PLUS			1.8
S2 S3	BEAM MINUS		2.7	1.4
S2 S3	BEAM PLUS		2.4	1.4

Chart I indicates the correct settings for the remote control unit. (Page 58 and 59)

be available until it is remembered that relays K1 through K6 form several shunt paths for the current. In practice the operation is about as stable as can be expected considering the small current involved, being as low as one-quarter microampere when the beam direction is near 178°. Instability, apparently caused by induction currents in multi-paired telephone cables, amounting to about one microampere is present and accepted. The error amounts to about 5 degrees and can be corrected when operating by adjusting the maximum meter reading at 180° by means of R8.

All remote control functions are duplicated at the transmitter for local operation. It is only necessary to place S1 in the **Local** position, disconnecting the receiver from the telephone line, and change the audio line amplifier input switch to the microphone position. The tuning motor can be lifted aside and the receiver operated normally. The transmitter audio level is adjusted by use of the VU meter or by means of the Millen 3″ oscilloscope connected across the transmission line. To restore the equipment to remote operation the reciprocal of the aforementioned must be accomplished

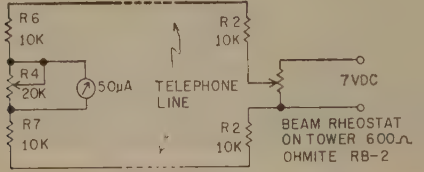


Fig. 6—Simplified circuit of the beam position indicator.

and in addition the receiver gain must b
turned to its proper setting so a maximu
plus 8 VU is applied to the telephone lin

The six element Telrex beam now in us
ten meters at WØDYG was erected
temporary use following the destruction
tornado of a thirty foot tower and Telre
element twenty meter beam. The comp
permanent antenna layout will provide
elements on twenty, five elements on fif
six elements on ten, and fifteen element
two, all being Telrex arrays. The buil
tower and mast heights combine to place
two meter beam seventy feet above gr
level. The twenty meter array will be lo
at 52 feet with the fifteen and ten meter ar
spaced equi-distant between.

Band changing mentioned near the begin
of the article can be accomplished by provi
additional relays which would operate whi
the transmit mode. They would operate
change the function of K5 to actuate a step
relay to energize additional transmitter and
ceiver combinations. The transmitters w
be relatively simple exciter-power ampl
combinations but the additional recei
become rather expensive. The relay system
preform the necessary switching of au
crystal switching, tuning and control would
come quite extensive. It really isn't worth

In summation it can be said that the sys
just outlined and described provides wha
desired of it in furnishing excellent ham op
tion from a poor operating location.

[*Continued on page* 170]

Next Step—Space Portable

by R. G. Coleman, VE3ANY
37075 Picaford Ave

Ever since Don Mix, then 1TS, operated the first ham portable with the McMillan Arctic Expedition in 1923, expeditions and amateur radio have gone hand-in-hand. Amateur sponsored expeditions have put many remote areas on the air and have provided rare DX for their brother hams. Our next great frontier is outer space. Plans are under way today for the exploration of the planets. What problems will beset the ham who operates portable on Man's first trip away from Mother Earth?

According to present plans the first manned step into interplanetary space will be preceded by the establishment of satellite stations, to be used as jumping-off points. The personnel of an advanced space station is expected to number upwards of two hundred, comprised mainly of scientists and engineers. Such a group might well count amongst its members enough hams to form a club. A club just naturally must have a club station. The communications crew of a space ship will, no doubt, be hams. Portable operation will result.

Transportation

Transporting amateur equipment will likely be classified as unessential and strongly restricted. Lightweight transistor and printed circuit rigs that could be carried as personal luggage are not likely to be useful over any great distance. How then is the space ham to indulge in his hobby? A feasible way would be for some far-seeing Project Chief to include amateur frequencies amongst those available on Government communications equipment. Then, as has been done on many installations it only remains for the space ham to arrange to use this equipment during off-hours.

Frequencies

A primary consideration is the choice of frequencies. It is probable that very little hamming will be done on the usual short wave bands. Nearly all signals on frequencies from 3.5 to 30 megacycles, originating on Earth, will be refracted and returned to earth by our ionosphere. During times of sunspot maximum activity this range may be extended to somewhat above 59 mc since part of the time VHF signals also are returned to Earth. This may apply to work from the surfaces of other planets, for we have reason to believe that ours is not the only one to have an ionosphere.

The region from 50 to 450 megacycles, at first glance, appears to be practical. However, there is a limitation in regard to this range of the spectrum that has yet to be resolved. The new art of Radio Astronomy makes use of emanations called "radio noise" generated by solar, galactic and inter-galactic sources. This noise peaks at various broad bands, some within the VHF spectrum. Our atmosphere and ionosphere filters this noise and not all of it reaches the Earth. In outer space this noise could reach a very high level, and could be the limiting factor in receiver sensitivity. Such radio noise could well limit VHF communication in space to certain "noiseless" bands.

Except for a few noise peaks from 3000 to 30,000 mc, microwaves are relatively unaffected by the atmosphere, the ionosphere or space noise. High-gain beam antennas for these frequencies are reasonably simple structures. It is probable that the future for space communication lies in this region of the spectrum. Due to size limitations, high-gain beam antennas of a portable or easily erected type are ruled out for the very low frequencies. Long distance space communication on these bands is improbable.

Line of Sight

All space radio, regardless of frequency, will depend upon a line-of-sight path. With no aid from atmospheric bending or ionospheric refraction, radio waves will behave like light, and objects will interrupt and scatter them. Working from a space vehicle in the region of a planet will at times necessitate moving many thousands of miles to gain a vantage point for contact with an otherwise out-of-sight location. An amateur in a colony on the Moon, located on the floor of a crater, would have to set up a reflector to be used at times to keep certain planets in sight and provide a relay. The erection of reflectors, and antennas on low-gravity airless bodies, such as our Moon, should not be too difficult. Techniques have already been worked out. Erection of even large parabolic antennas would be aided by low-gravity conditions, and need not be beyond

the capabilities of a determined amateur radio group.

However, due to the line-of-sight stigma, contact with heavenly bodies will not be a continuous procedure. A rigid schedule of operating times will have to be set up, based on celestial mechanics. A glance at fig. 1, position 1, will show that when Venus or Mars is in line with the Earth, the only contact possible will be from Venus night to Earth day, and from Earth night to Mars day. Near opposition, position 2, Mars day to Earth day contacts only will be possible. During Earth night Mars will be nowhere in sight. Similar comparisons could be made for the other planets, when the conditions for contact would depend upon the time of day and the position of the planet in its orbit around the Sun. Far from being a tenuous cloud of flaming gas, the Sun, with its tremendous mass, its strongly ionised chromosphere and intense magnetic field, would cause bending and deflection of signals. It has been estimated that this "blind spot" would extend for approximately 15 degrees each side of the Sun, as viewed from Earth. If such is the case, there would be times when the Planets would be blanked out and communication would be impossible. For instance, if the Earth stood still, as can be seen from fig. 1, Mars would be incommunicado for 57 days of its 687 day year. Venus would be blanked out for 18 days, and in the case of distant Jupiter "quiet hours" would last for 360 days. But the Earth moves also, and these times would be somewhat shorter than shown here. Nevertheless, there would be periods when relaying via some transponder station out of line with the Sun, would be necessary.

Distances

Astronomical distances are great in terms of Earth miles. A signal, originating on Earth would be scattered very thin by the time it reached Jupiter's Ganymede or Saturn's Titan, both larger than our moon and both likely bases for closer study of these huge planets. Consider a typical parabolic beam antenna of, say, 100 square feet in area and a beam width of 3 degrees. This condition would be satisfied by a parabola of slightly over 11 feet in diameter, with 25 wavelength aperture as operated on the amateur 2300 mc band (although sharper beams are possible by increasing the frequency and the diameter, a space ship is not likely to have much larger, and an Earthbound ham would not likely be able to summon up the power necessary on much higher frequency.) By the time a signal, originating on Earth from such an antenna, reached Jupiter, the signal would be spread over 495.2 million square miles of space. For Saturn it would cover 1665 million square miles. Think of the infinitesimally small part of this signal an antenna of only 100 square feet capture area would receive at a distance from Earth of the planet Saturn. There are 278,784 times square feet in just one square mile. But are dealing with 1665 million square miles works out to an attenuation of approxima 464,175,360,000,000 times down! Obvio some very high-gain receiving equipment be needed at both ends of the link. Since planets of our Solar System all lie in a r tively narrow flat plane, the ecliptic, this s ation can be improved by the use of a flat like beam, concentrated in one plane. Even sharpness of beam pattern and power g plus high power, will be a deciding factor received signal strength, to a much gre extent than it is here on Earth.

If communication is to be established at it will require the accurate aiming techniq used in astronomy. Broadcasting will be of the question. Calling another ham fo relay or a sked will require that he not c be tuned to your exact frequency, but a aimed to your exact position in space. Au matic tracking will be necessary to maint signal strength. Antenna bearing will have be continually corrected for revolution of body on which the antenna is mounted, a relative movement of both ends of the li An astronomical almanac will become a n essary part of a space ham's literature.

Doppler

Another factor, already recorded on sign from the Explorer, Vanguard and Sputt satellites, a well-known phenomenon to th who have monitored the "Collins Collosus" 49.8 mc., and the cause of the garble on a rora reflected signals, is the frequency sh caused by the doppler effect. Meteors cause readily detectable frequency change on sign reflecting from their ionised trails. Mete enter our atmosphere at speeds from 25 to

[Continued on page 168]

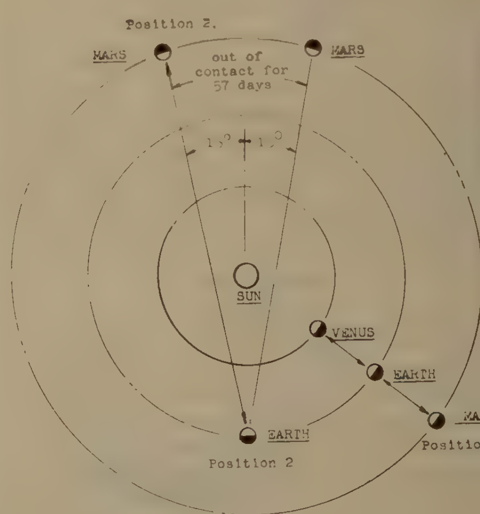


Figure 1

Self-Monitoring Made Easy by a *Gimmick*

George Bonadio, W2WLR

Imagine tuning yourself in on your own receiver, just like many other signals, at a little over S9. Check your own stability, your splatter, your distortion, (especially if you have a scope) just like the other fellows do for you.

I know, the F.C.C. regulations require ; but how many operators do? This gimmick lets one do it easily, quickly and frequently.

A short, external to a receiver input system, can reduce the incoming signal about 40 to 60 db. This is not enough reduction for the monitoring process. Around 100 db of subduing is required. By placing a short from the first rf grid to ground, a loss of up to 140 db at 160 meters to 100 db at 10 meters is usually accomplished.

Thus the gimmick.

This is easier done than said.

One needs to bend slightly the end plate on the rotator of the antenna trimmer condenser, so that for about 180° of the rotation this plate is shorted to the stator plate. One must think how this goes, to see that only 180° of the operation is affected. Care must be taken to avoid bending too much, which would require bending back. This loosened the base solder on mine. When I resoldered I loosened another plate. After I got it back to normal, I used just a corner of the plate to make the bend.

This has worked for 5 years without trouble. My antenna circuit looks directly into a non-shorting coax relay with the hot signal going by. On all bands, using the gimmick, my 100 watts output lies between S9 and S9 + 40 db.

If, however, one does not have an antenna trimmer, he needs one, and fig 1 illustrates how to connect it. A Cardwell Trim Air PL6003 has a practical tuning range of less than 3 to over 30 mmfd. An additional advantage is that antenna reactances may be tuned out, and a better signal strength be realized, especially above 7 mc.

It's nice to be able to tune either side of one's own signal and be sure that there is no splatter there. Any splatter will appear as it does around the signal on the air. It's good to know to be sure. ■

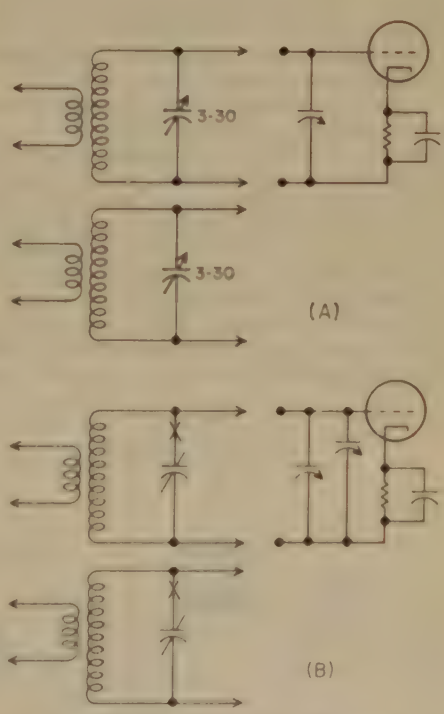


Fig. 1—Diagram A shows each coil with an individual trimmer condenser, but no antenna trimmer. Circuit B shows the removal of the individual trimmers and the inclusion of an air tuned trimmer in the first rf grid.

THE PARAMETRIC AMPLIFIER

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A number of papers and articles dealing with parametric amplifiers have been published. None of these have dealt with a practical device which could be used in a system.

In addition to presenting the construction and operating details for a useable 2 meter preamp it is hoped that this article will get the ham fraternity "into the act" as it were, putting their great wealth of inventiveness to work on the further development of the device.

For the uninitiate, a parametric amplifier is a device which amplifies. In particular it amplifies weak signals at VHF and microwave frequencies. It will of course amplify at low frequencies (even audio) but really comes into its own at those frequencies where vacuum tubes are either not working at all, or are providing noise figures no better than could be obtained with crystal mixers alone.

It is not the purpose of this article to explain the need for good noise figures. It can however be pointed out that as frequency increases the noise which your antenna sees is decreasing. From this it can be shown that what is considered an adequate noise figure on a six meter receiver would not be taking full advantage of the band capabilities on two meters, and so on up the spectrum.

Unfortunately vacuum tubes, and consequently noise figures, are getting worse as frequency is increased. Advances in vacuum tube design have made it possible to get noise fi ures on two meters which are bordering MUNF (maximum useable noise figure). T parametric amplifier should extend this bord line MUNF relationship up into the microwa region.

Construction

The construction of your parametric amp fier begins with a coax line filter. A skelet view is shown in fig. 1 and a dimensional vie in fig. 2. The dimensions given are for use the two meter band. The same device scale to any other band will work as well. Fig. and 4 show the details involved in mountin the varactor and tuning the coax tank. Th dimensions given were taken from an actu working model. They should not, howeve be construed as optimum. (It is true for in stance, that the same coax tank, capacity loade to resonate at six meters, gave equally goo results both in gain and noise figure.) Th input and output links should provide a matc for the feedline. The resultant coax tan should, when inserted in series with the fee line to your receiver and resonated to th receiver frequency, act as a band pass filte with little or no change in receiver sensitivit

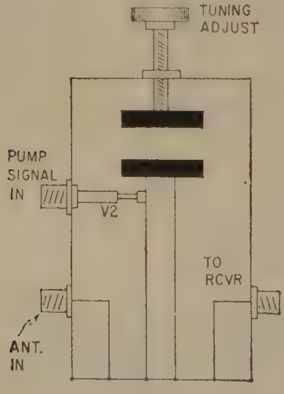


Fig. 1

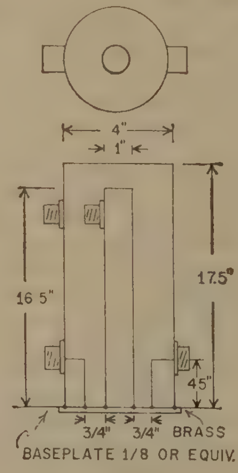


Fig. 2

or noise figure. (If your present station equipment includes such a filter you have the job half done.) The varactor mounting as shown in fig. 4 takes advantage of the fact that the type N connector center pin provides a snug fit for the varactor pin. The object is to get the varactor mounted between the top (approx.) of the center conductor and the sidewall with as little series inductance as possible. Bypassing of the sidewall end of the varactor is provided, on two meters, by the inherent capacity of the type N connector and the coax line which goes to the pump oscillator. (On six meters some additional capacity proved advantageous.)

Material

The material used to fabricate the coax tank will depend on your pocketbook and scrounging ability. The particular device described was part of a surplus frequency meter labeled BC 1108 A. Material is silver plated brass. A copper coax tank would certainly work, and on the lower bands a tomato can type of thing would probably give useable results.

Pump Oscillator

The construction of a pump oscillator is not covered in this article. Specifications for this oscillator are as follows. Center frequency, twice the signal frequency. Tuning range, 5% above and below the center frequency. Power input adjustable in the 100 mw to 1 watt range. Stability: warm up drift of 0.2% is satisfactory. Calibration: at least 1% intervals.

In short, any well designed LC oscillator using tubes such as 6J6, 6C4, 12AT7 etc. will be satisfactory. The tuning control should be calibrated so that it can be reset to a predetermined frequency. The actual calibration in frequency is only for convenience in taking data and getting the amplifier set up. Link coupling from the oscillator is recommended for convenience in adjusting the output level. It is important that the coupling arrangement provide a dc return for the varactor.

Adjusting and Tuning (or Making It Go)

There is no exact procedure for tuning up the parametric amplifier. On the other hand experience has shown a general procedure which if followed, tends to give the most consistent results.

The first step is to tune the coax tank to the signal frequency with the varactor and pump coax in place. (pump oscillator turned off.) The simplest way to accomplish this is to tune in a signal with the tank disconnected, insert the tank in series with the feedline and adjust the tuning until the signal is at a maximum. If your coax tank and its attendant coupling links are properly adjusted there should be no deterioration in signal strength or signal to noise ratio. If you pass through a maximum with the tuning adjustment and the signal is appreciably weaker than it was without the coax tank in place it is likely that the coupling links are not adjusted properly. Judicious bending, pushing or squeezing of the links should result in a more optimum coupling adjustment. If the signal cannot be peaked with the tuning adjustment, you have not followed the dimensions closely enough. If the signal starts to get stronger with the capacitor all the way in, your center conductor is too short and vice versa. If too short, a small fixed or variable padder can be installed in parallel with the adjustable capacitor. If it is too long, you will just have to shorten it.

Having achieved a satisfactory adjustment of the tank, it is now time to turn on the pump oscillator. The pump frequency should be adjusted to approximately twice the signal frequency and the coupling moved in and out while observing the signal strength. A number of startling developments will occur. The desired result is to have the received signal increase in strength. You have three adjustments at your disposal. The pump frequency, the coax tank tuning and the pump amplitude. Leaving the tank tuning at the previously determined maximum signal adjustment, the pump amplitude should be increased slowly while the frequency is moved back and forth around the 2f frequency. The received signal should increase in strength as observed on your output or signal strength indicator. This adjustment procedure should be followed until the amplifier breaks into oscillation. Pump coupling should then be decreased until oscillation stops and increased to a point about 6 to 10 db below the oscillation point. At this adjustment

[*Continued on page 159*]

Fig. 3

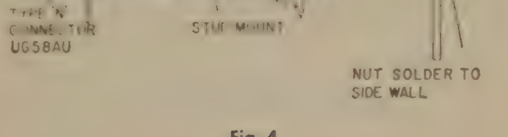


Fig. 4

A Reader Reports on the Hammarlund HQ-170

Conway L. Wilson, W4WQT
Route 5 (Lafayette Pike)
Clarksville, Tennessee

(1) The receiver is quite *versatile*. AM, CW and SSB all tune in easily.
(2) The mechanical stability of the receiver is excellent.
(3) The electrical stability or drift after warm-up is as good, if not better, than any present day receiver using the same general type front end.

The HQ-170 is a big receiver on a heavy duty chassis with excellent workmanship. It seems to be designed for ease of maintenance. It weighs 38 pounds and is 10½″ High by 19″ Wide by 13″ Deep. On the rear panel there are terminals for a 3.2 ohm speaker; terminals for balanced or unbalanced antennas with a separate set of terminals for a 6-meter antenna; a jack for external send-receive relay connections; a fuse holder and two S-meter adjust pots. The send-receive relay would break a regulated 105 volts dc to front-end screen circuits and to the S-meter amplifier plate circuit.

The front panel contains an array of some twenty items. Evidently some human engineering was used in planning the control locations because once you learn the potential use of each control you find that those controls used most often are placed in the most easily used position.

The physical construction left me with one minor complaint. In order to get to the Crystal Calibrator for calibration against WWV or in order to get to any of the tubes for replacement it is necessary to remove the receiver from its cabinet. In other words . . . where is the cotton-picking top lid? Three screws on the rear panel hold the receiver in its cabinet, however, and it slides out easily. Checking the calibrator against WWV two weeks after I purchased the receiver, showed it to be still zero beat with WWV on 10 mc. Small wonder, considering that the crystal employed is a low drift 0.005% crystal and the voltage used is regulated.

The Frequency Coverage

The HQ-170 is a "ham-band only" receiver with complete coverage of all bands from 1[illegible] through 6 meters. The coverage is broken [illegible] into two dials. One dial has part of the ban[illegible] on it while the other has the other bands a[illegible] an extra 0 to 100 Arbitrary Scale. The tw[illegible] dials, which move at the same time and a[illegible] controlled with one tuning knob, are calibrat[illegible] with 5 kc divisions on 160 through 20 meter[illegible] 10 kc divisions on the 15 meter band, 20 k[illegible] divisions on the 10 meter band and 50 k[illegible] divisions on the 6 meter band. By offerin[illegible] "ham bands only," stability is made possib[illegible] and of course anytime a receiver is stable, se[illegible] lectivity can be offered, but more about th[illegible] later. The coverage of each band is 1.8 to [illegible] mc, 3.5 to 4 mc, 7 to 7.3 mc, 14 to 14.4 m[illegible] 21 to 21.6 mc, 28 to 30 mc and 50 to 54 m[illegible] Thus the 15-meter band provides short-wav[illegible] broadcast coverage, including the Voice [illegible] America.

Selectivity

Since the receiver is extremely stable it ca[illegible] offer razor sharp selectivity. The respon[illegible] curves approach mechanical filter skirt sele[illegible] tivity. The selectivity is certainly offered in [illegible] versatile way. You are never tied down to o[illegible] or two degrees of selectivity with this receive[illegible] The band-pass is variable from a 500 cyc[illegible] bandwidth for cw up to a full 6 kc bandwid[illegible] for clear channel AM. You can select eith[illegible] the upper or lower sideband and have a choi[illegible] of either 0.5, 1, 2 or 3 kc selectivity. You ca[illegible] switch in both sidebands and have a choi[illegible] of either 1, 2, 4 or 6 kc selectivity. This mak[illegible] a total of 6 different degrees of selectivity.

Band-Pass Tuning

The Vernier Tune Control allows tuning [illegible] to 3 kc above or below the frequency the D[illegible] is set on. The control offers an 8 to 1 tuni[illegible] ratio with calibration points every 500 cycl[illegible] With a little practice, frequency differences [illegible] 50 cycles or less can be read. The readin[illegible] taken from calibration points under the co[illegible] trol knob pointer on the front panel are ve[illegible]

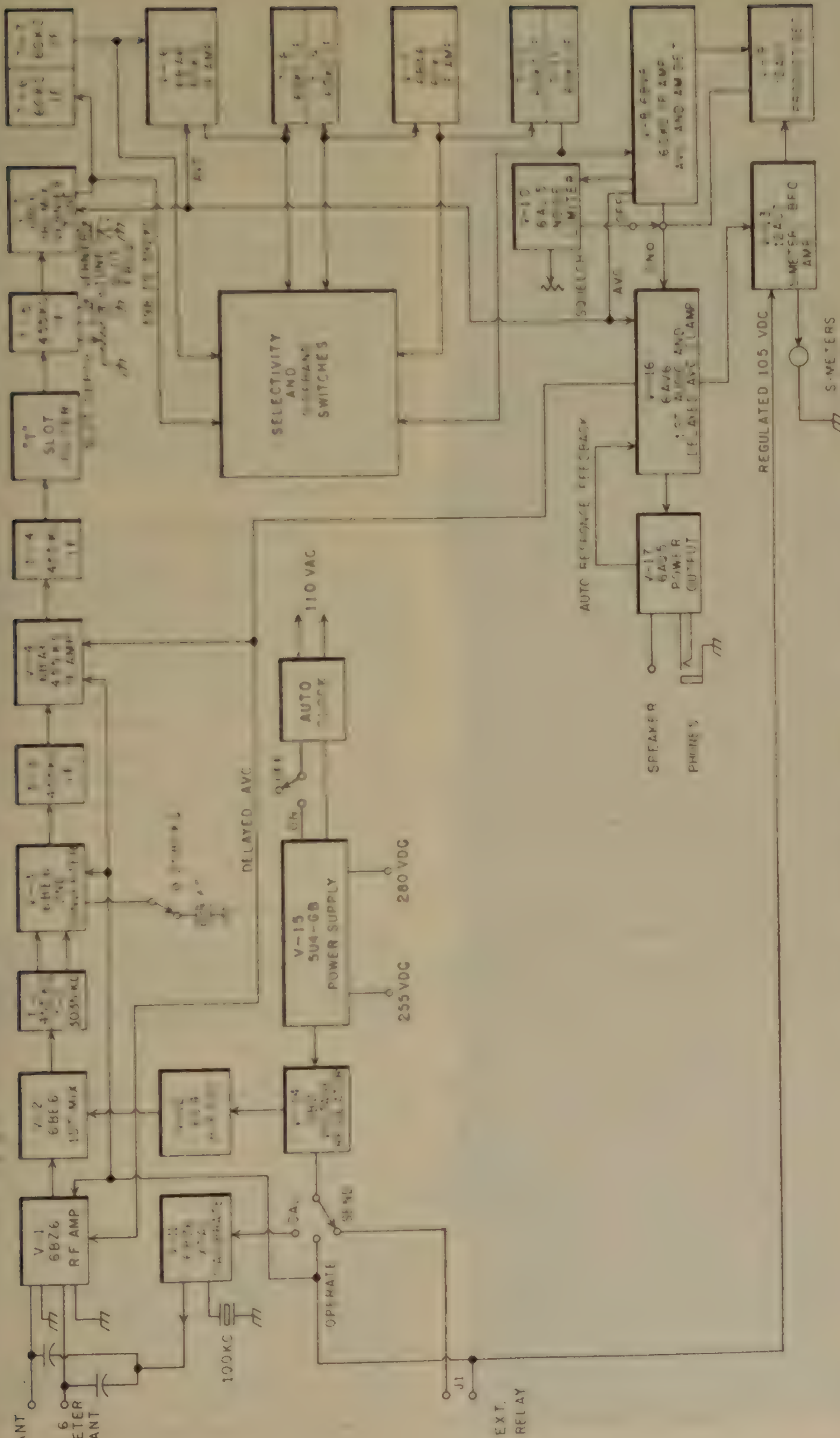


Fig. 1—Detailed block diagram of the Hammarlund HQ-170.

accurate. Features of this type can only be useful on receivers that offer stability. This receiver is so stable you can pound on the cabinet without effecting zero-beat. The band-pass tune feature opens the way for ham-band enjoyment you may have never known.

This type of band-pass tuning, which I shall term "Electrical Single Mixer Band-Pass Tuning," should not be confused with the type used in the Collins receivers. It can best be explained by saying it is possible to tune around in the 455 kc band-pass and present what you find to the 60 kc upper/lower or twin bandpass. In other words, you do not move the original tuned in signal or frequency for it stays where you tuned it in on the tuning dial. In effect, it allows you to sneak a look as far as 3 kc above or below that dial reading and do so without disturbing the main tuning dial frequency setting.

For example, let us assume you are the NCS of either a CW or Phone net. You could set the dial on the Net frequency and with the Vernier Band-Pass Control be able to tune in stations as far as 3 kc above or below the Net frequency without disturbing the dial setting. You can even tell the "culprits" how far off the Net frequency they are and give the reading in cycles. You can tell a station how "wide" he is on the band. It also offers real ease of tuning for SSB signals. Stations a few cycles apart can be tuned in without disturbing the dial. The 8-to-1 tuning ratio is a wonder.

The Detectors

A normal diode "envelope detector" is built in for those desiring to detect AM signals in that manner. A linear product detector is switched in for cw and SSB reception. The double-triode product detector recovers intelligence from an rf signal with the least amount of distortion under large variations of input signal strength. Although the bfo covers a range of 2 kc above or below the 60 kc i-f, I leave mine set for 60 at all times. This keeps the dial reading correct at zero beat. The bfo circuit uses the well known high stability Cl circuit.

The AVC Circuits

At long last you can join an SSB roundt with both strong and weak stations and back and enjoy the "conflab" without keep one hand on the rf gain control. The A switch offers three speeds of AVC decay ti All three use very fast attack time. The S-m reads at all times and gives readings accu enough to relate to those desiring a report this type. The Fast AVC can be used on with no overloading effect. The Slow AVC good for SSB roundtables if there is a la variation between signal strengths. No sig are distorted nor did I have to ride the g control. Of course the AVC can be swite out at any time and although the S-meter reads, the readings are not accurate. The meter is calibrated to 40 db over S-9 an adjusted so that a signal input of 50 microv gives a reading of S-9.

The Crystal Calibrator

It is accurate. It is turned on with a swi on the front panel and zero-beat is obtai with bfo on at or near some 100 kc multi frequently. If the dial is off a few cycles th is a Dial Scale Reset knob on the front pa to set the dial for accurate readings.

The Noise Limiter

The noise limiter is a good one. A 6A functions as a positive and negative noise pul clipping limiter and a front panel control c be set for the degree of limiting desired. T control, when advanced, is used as a sque for AM signals.

Audio Amplifier

One watt of undistorted output is provi to 3.2 ohm speaker connections or to an e phone jack on the front panel. A 6AV6 dri and 6AQ5 output tube is used in the au

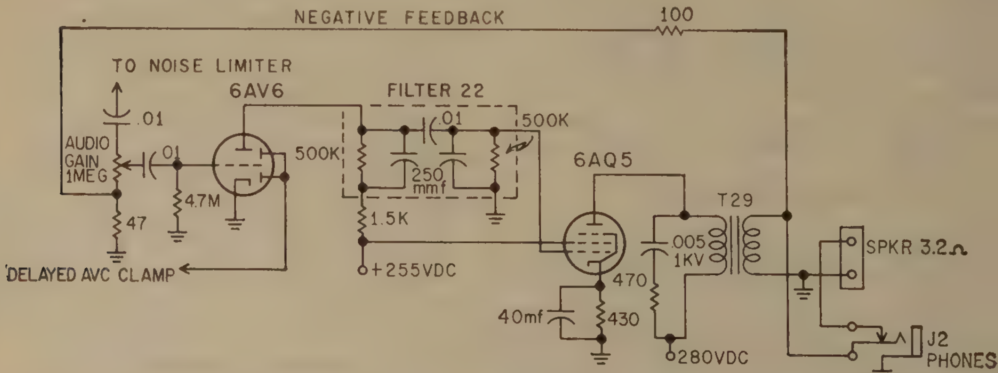


Fig. 2—Schematic of the variable feedback "Auto Response" audio amp.

circuit. A variable negative feedback is used with maximum feedback on strong signals for high quality reproduction and less feedback on weak stations to narrow the response for a maximum signal to noise ratio. The circuit is automatic and is called "Auto-Response." The circuit is shown in fig. 2 for those who care to modify their present receiver or put the circuit into a home brew receiver.

The Slot Filter

The Slot-Filter response curve tells the story about this "must" feature. The razor-sharp slot can be magically tuned around anywhere plus or minus 5 kc over the band-pass. It gives better than 40 db attenuation to the unwanted heterodyne or interfering cw signal. Another control, the Slot-Depth Control, can be used to balance the unwanted signal down to a total of 60db. This type circuit, called a Bifilar "T" Trap by Hammarlund, is a must for present day crowded bands.

The Clock

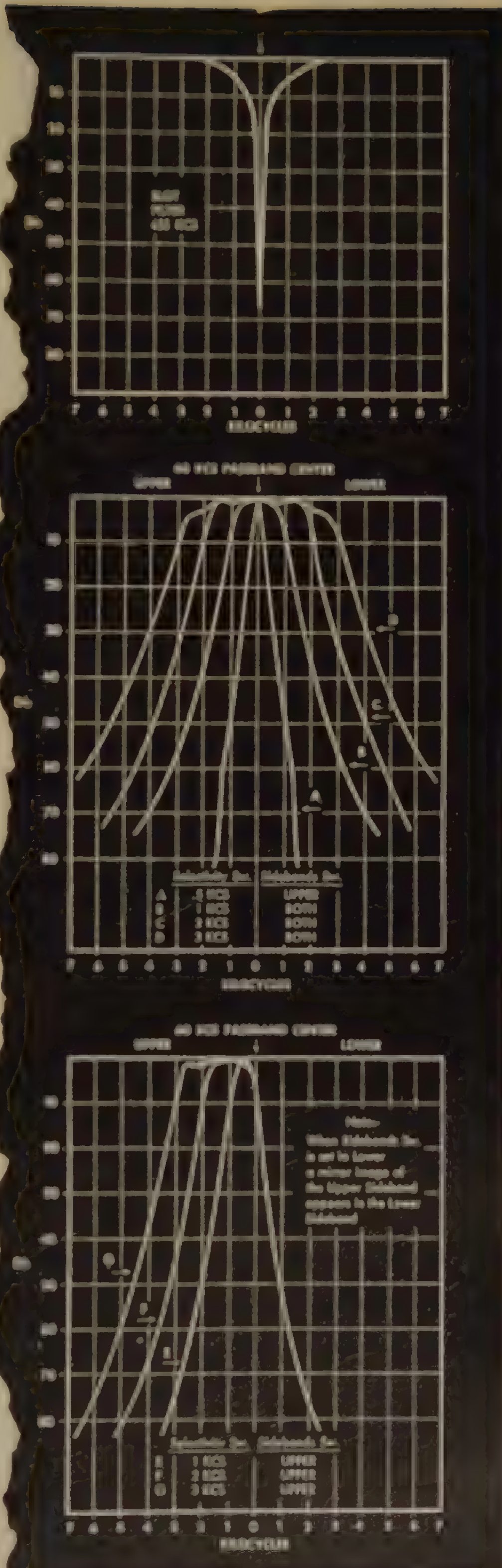
The receiver evaluation could not be complete without mention of the clock which comes as an "extra" for $10. This gadget can eliminate warm up drift from bothering your operation, remind you that it is "Net" time, etc. You have only to set the clock to turn on the receiver about 30 minutes prior to your normal operation time and the receiver will be warmed up and ready to go with drift-free operation.

And That's Not All

Yes, there are still more features that must be mentioned. There is the antenna compensator that permits compensation for loading effects of the antenna or transmission lines. There is the sensitivity, with an average 1.5 microvolt AM signal producing a 10 to 1 signal to noise ratio or an average 0.5 microvolt cw signal doing the same thing. There is the double conversion that is used on the 160 and 80 meter bands with the two i-fs being 455 kc and 60 kc. There is the triple conversion used on all the other bands with a crystal controlled second mixer that gives an i-f of 3035 kc. There is the extremely stable hf oscillator that operates on the high side of the signal on all bands except 6 meters. There are the low-loss sockets, coil forms, and bandswitch wafers, plus temperature-compensating capacitors; and the regulated dc to the oscillator circuits which all help to provide the high degree of stability so vital to any selective receiver. The drift, after warm-up, is less than 0.01%. I measured only about 700 cycles drift during a 20-minute warm-up from a cold start.

There is the unique method of sideband selection. It is accomplished by shifting the

[*Continued on page* 157]



CQ Tests the Heliwhip

TYM (The Young Man)

Some of the most frustrating experiences in my ham radio history have been tied in with my attempts to use short antennas on my mobile installations. When the all-band tapped coils came out I rushed right out and invested in a completely new antenna system: bumper mount, aluminum bottom section, adjustable coil, and top section. It worked pretty well for a few days and then began to behave erratically.

Soldering of more permanent leads on the coil shorting button didn't help. Finally I gnashed my teeth at the manufacturer and was given a new (and much more tricky to use) wiper arm which would reach out and grab hold of just one turn of the coil rather than shorting two turns. Except at night when you were lucky to get the thing moved where you wanted it without bending the coil badly. And still it was erratic.

When I finally got around to buying a new car I decided to start over again with something a bit more promising. This turned out to be the *Rafred* remotely tuned antenna. This was a real pleasure to use and gave me very little trouble. Switching from band to band was quite simple and signal reports were satisfactory.

Then came the sport car. After driving around a couple of the little sports cars I just couldn't stand to drive around my great big Ford Country Squire Station Wagon any more. The difference in handling was fantastic . . . driving could be *fun*.

Naturally I had to put ham gear into the Porsche, when it came. And then came the problem of the antenna. Sure, on the great big bumbling old station wagon I could mount anything at all without it looking too badly. But on the new little bug I couldn't put one of those eight foot poles with a big coil in the middle. Not only would it look silly, but it would slow me down a good five miles an hour in the higher speeds.

So, what about those new Heliwhip antennas? A quick trip to the local distributor and I was all set with the four foot long 10 meter whip plus the base mounting insulator (made by the same company). I was a bit worried about the base mounting since I didn't want to use one of those big black jobs that are so popular on my little car.

The Heliwhips are made by spiral windir the antenna around a fiberglass tapered ro They have units for 10 through 80 meters. Tl bandspread of the 10 meter model is 1000 k while the 80 meter unit only covers 60 kc. Tl final tuning of the whips can be adjusted t removing some of the top turns of the whi an easily accomplished procedure. The ban width is governed by the limits of 2:1 SWR.

Well, how did it work? I haven't worked lot of DX with it yet, but I am able to wo out when the band is open running 15 wat and it seems to load up nicely over the who 10 meter band. Local contracts are exceller and I always get exceptionally good sign reports. The Mark Mobile base mount HWM- fits right in the hole left by the broadcast a tenna and is not out of place even on my sma car. The four foot antenna is entirely in keepi with the car size and should be welcome t any ham who doesn't want to attract too muc attention to his mobile operation.

The only inconveniences I have had as result of the Heliwhip are the drag at hi speeds which cut down my top speed by abo three miles an hour and the noise generat by the whip as I get up to 80 and 90 miles hour. The whip flexes about eight inches as approach optimum cruising speed (90) and t whistling is pretty loud. This should not much of a problem for users of Detroit Chron since it is not safe to drive them that fast.

The Mark Mobile Heliwhip, to sum it u is a reasonably priced short antenna whi works quite well and will satisfy the ham XYL who wants a bit more dignity wh driving.

THEY MELT

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Here is a way to sink coil terminal brads into polystyrene rods without using small diameter drills so often broken. The polystyrene heats during the drilling and and then freezes when you stop. The drill breaks when you try to free it.

Fig. 1—Place the rod in a steady holder such as a vise. Don't squeeze the rod too much. Tin the brad, then hold it in position above the rod with a long nose pliers. Use a soldering gun to heat the head until the point of the brad becomes hot enough to melt the rod. The brad will easily press into place under low heat and will "freeze" in the rod as it cools.

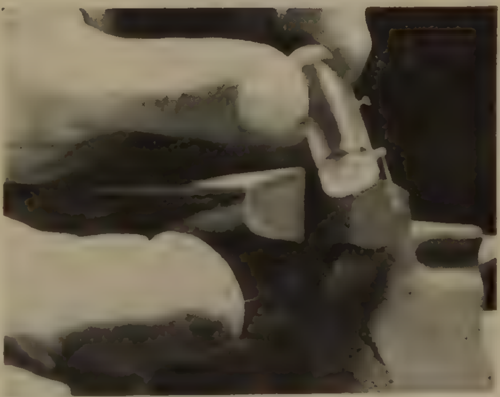

Fig. 2—Leave the head about 1/16 above the rod. Sink another brad where it is calculated that the coil will end. Scrape insulation from the end of the wire. Then attach and quick-solder it to the first brad. Wind the coil.

Fig. 3—When the wire is attached and soldered to the other brad, paint the coil with dope.

Graphic Recording of Earth Satellites

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The radio passings of the Sputniks, Explorers and Vanguards have been monitored in many different ways. High speed audio tape recordings and high speed graphic chart recordings of signal intensities have been made. The majority of the set-ups required a fair amount of equipment to provide almost a cycle-by-cycle account of the passings. The system to be described in this article is a simple but interesting way to keep track of any satellite passings on a minute-to-minute basis and yet provide continuous 24 hour unattended operation.

The system operates in the following manner. A receiver is tuned to 40.002 mc or 108 mc. In the case of the Sputniks, many ionospheric effects are noted at 20.005 mc so this frequency should be avoided. The rectified i-f output of the receiver is used to drive a graphic strip chart recorder such as the Esterline-Angus, Varian, Brush, Texas Instruments, etc., operating at a slow chart speed (2-5 inches per hour). Those recorders with dc amplifiers c be driven directly from the rectified i-f outp AVC, or the "S" meter terminal voltage. T E-A recorder requires one ma through 15 ohms to operate to full scale. This can usua be obtained by rectifying the i-f output with crystal diode and then applying it to the corder input. An increase in rectified volta can be obtained by placing a parallel circ tuned to the i-f before the diode. The circ is shown in fig. 5.

A portion of the amplitude vs. time reco ings for two consecutive days are shown in fi 1 to 4. These are of Sputnik I taken on 40.0 mc using a vhf receiver with recorder outp and a vertical folded dipole above a grou screen. The receiving location was San Anton Texas. Chart speed is 3 inches per hour w vertical divisions every 15 minutes.

Two radio passings are noted in the eveni and two passings in the morning. Several thin

[*Continued on page 156*]

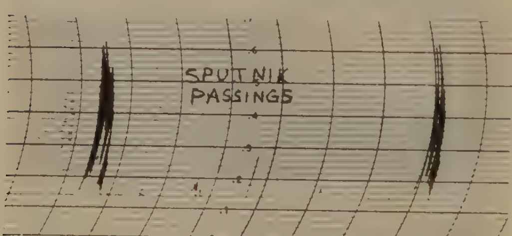

Fig. 1—October 21, 1957 PM passing.

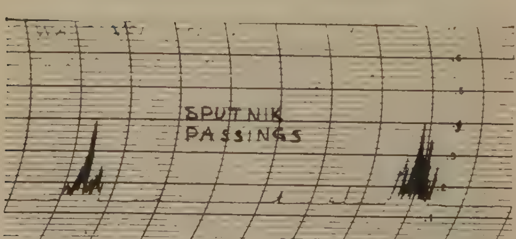

Fig. 2—October 22, 1957 AM passing.

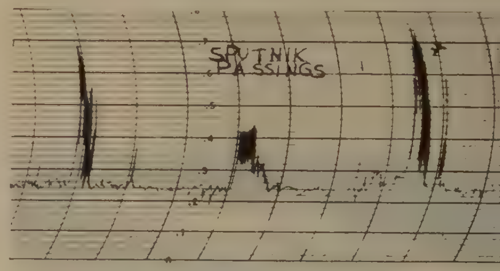

Fig. 3—October 22, 1957 PM passing.

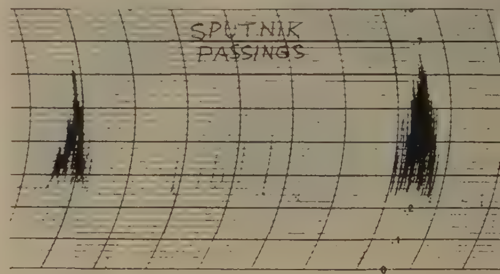

Fig. 4—October 23, 1957 AM passing.

Readjusting Mixer Trimmers

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St. Paul, Minnesota

The main problem in adjusting the mixer trimmer of a receiver is to get the mixer to "track" the oscillator. All across each ham band it should be away from the oscillator frequency by the value of either the first or only i-f. This is a practical impossibility. Therefore you must either balance the tracking over the band to the best of your ability, or peak the tracking on the part of the band you desire.

Fig. 1—Feed a signal generator signal at the frequency of the low end of the ham band into the plate of the rf tube. Adjust the trimmer capacitor for maximum S-meter reading, or maximum swing of a vacuum tube voltmeter connected to the avc bus.
Then feed the signal at the frequency of the high end of the band. There will be a difference in readings. If the second reading is very low, readjustment the mixer trimmer for maximum reading, noting whether capacitance is added or subtracted. This must be determined from the specific trimmer capacitor used.

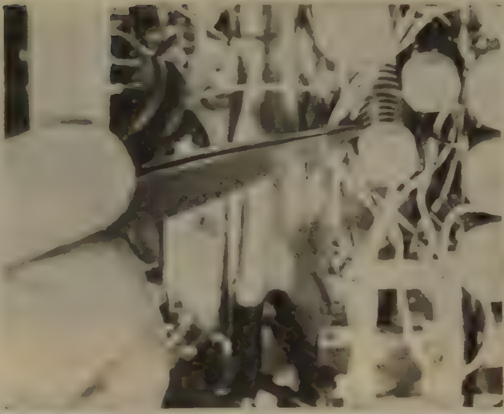

Fig. 2—If more capacitance is added, the mixer is tracking too slowly and the mixer coil turns must be spread slightly. If the capacitance is decreased to get maximum readings, the mixer is tuning too fast and the coil turns must be squeezed together.

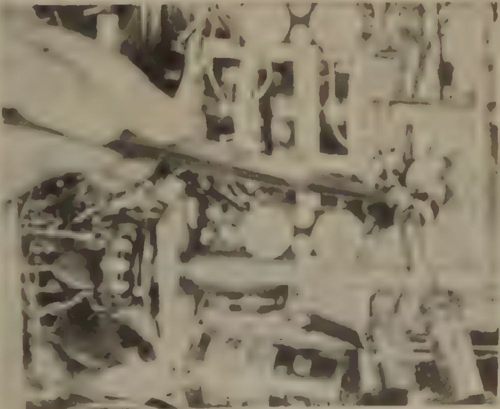

Fig. 3—Sometimes the cut-and-try method with fixed capacitances may be required to do the job, similar to the one shown here being added to an oscillator coil.

THE TEN TUBE SUPER DUPER SUPER

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If you're one of many hams with a yen to build a really selective receiver that's convenient in size, you are at this moment as little as $75 and the construction time away from having your own. The cost will depend upon how heaping is your parts box.

This double conversion, ham band receiver took first prize at a recent St. Paul Radio club building contest. It covers phone, cw, or SSB on six ham bands and MARS with 3 kc selectivity. The cabinet is just 7″ high, 14″ wide, and 8″ deep.

The first i-f is 2 mc, the second is 85 kc. There are eleven tubes. The use of only one bandswitch wafer, in the oscillator simplifies coil wiring and adjustment. Most internal wiring is standard RETMA color coded with te phone company switchboard scrap wire.

Mixer and tuning coils are wound on po styrene rods. Oscillator coils are wound ceramic forms with adjustable powdered ir slugs.

Components used are good quality pa box specials wherever possible. The dimensio and values given are those used in the pri winning receiver. When these are critic fundamental principles are also mention This avoids difficulties when you modify cording to personal preference or availa parts.

Your XYL's ears will be less pink if y check the parts list and get together everythi

will need before you start.

Here's How

Center the front panel on the chassis (see 1). This panel also serves as the front of cabinet, if used. Drill or punch ⅛" holes d temporarily bolt the panel onto the chassis h 6-32 bolts ½" long.

Through the lower face of the panel and nt of the chassis, drill seven ⅜" holes for six switches and the phone jack. Be sure center the bandswitch hole.

Remove the panel from the chassis. Through panel, drill one ⅜" hole for the rf gain ntrol. Drill another for the tuning dial where own in fig. 1 if the dial will be of the cord ve system, as shown in photo. Punch a le for the S-meter, if used. Drill a starting le through the panel and carefully cut out window for the dial with a power saw or nd hack saw. Trim rough edges with a file. rmanently remount the panel on the chassis.

Cut a rectangular hole through the top of chassis for the dial cord drum, if cord ve is used. Lay out the hole with pencil and it out with a hacksaw if a square hole tter is not available.

Gather all parts to be mounted on top of chassis in preparation for the part-position- "checker game."

The three-gang, 25 mmfd per section, tuning capacitor can be bought as a widespaced FM tuning capacitor, or made. This one was taken from a surplus Beacon 200-400 kc BC-1206 receiver and the trimmers were removed.

The capacitor plates were modified as follows: On each stator section, plates 1, 2, 4, 5, 7, 8, 10, 11, and 12 were removed. On each rotor section, plates 1, 2, 3, 5, 6, 8, 9, 10, and 11 were removed.

Adjustment screw holes were retapped for mounting with 6-32 screws. This capacitor proved to have extremely good stability even on six- and ten-meters.

"Checkers"

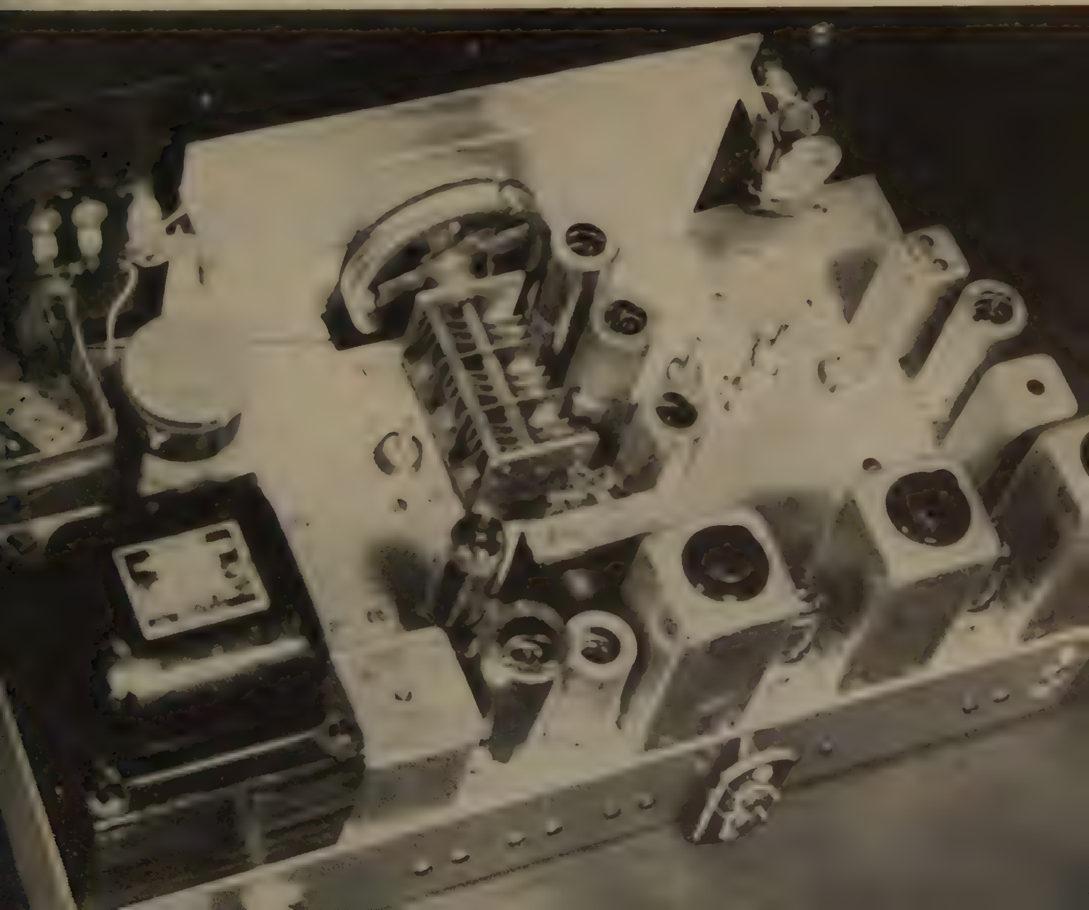
Make a "checker board" by taping a large sheet of paper on the top of the chassis. Rules of the "game" are simple but important.

The problems in double conversion are:

1) To keep the crystal oscillator away from the front end to maintain short plate and grid leads and to minimize crystal radiation into the front end wiring.

2) Mount the front end components close together to assure short leads for proper inductance in the tuned circuits on high frequencies.

In order from front to back (see fig. 2), mount the 6BA6 rf, 6J6 oscillator, and 6BE6 mixer tubes. The 6BA6 should be close behind the 6J6.



Place the power transformer in the right rear corner.

Place the first i-f transformer can in the left rear corner. Use the holes in the plate below each can to mark mounting holes on the paper. From the center of the can, draw a line on the paper parallel with the edge along the rear of the chassis. Other components should be centered on that line (see photo)

The 6AQ5 power amplifier tube goes in front of the 12AT7 audio-bfo tube.

The second converter stage should be compact and close to the i-f can in the left corner to assure short leads. The 2 mc i-f can may be purchased or may be a 455 kc i-f can modified by removing a few turns at a time and checking with a grid dip meter until the can resonates at 2 mc.

Place the output transformer close to the 6AQ5 but away from the strong fields of the power transformer.

The 5Y3 rectifier tube is placed at the edge of the chassis to keep heat away from other components.

Position the remaining components on top of the chassis as seen in fig. 2. and the photos.

Shift the components around until they are in desired locations—this is playing "checkers."

With a punch, mark the positions of the holes for the components. There is no need to scratch the surface of the chassis with pencil marks.

Be sure to line up tubes so grid and plate leads are short.

Remove the paper, drill or punch holes accurately, and mount the parts.

Underside

On the bottom of the chassis (see fig. 3) the parts must also be "played with" for final positioning, but the chassis underside must be visible so you know where you have mounted parts on the top. No paper "checker board" therefore necessary.

Place, but do not mount, the two divid which separate components of the rf, oscillat and mixer.

The bandswitch is among the most diffic parts to line up properly. To aid installati and alignment, the shaft was cut between t first and second dividers and joined with ¼" shaft coupling. It might be more co venient, however, to mount the coupling ahe of wafer S1c and the first divider.

Place the dividers one at a time against t inside of the panel and circle the bandswit hole from the front with a pencil to get t hole size and position for the bandswit shaft. Be sure to allow room nearby for t avc switch. Drill a ⅜" hole in each divider the pencil circle to allow clearance for t ¼" shaft.

Run the bandswitch shaft through the seco divider and mark holes for mounting the wa screws. Drill the holes.

Mount Controls on Front Panel

The bfo-acv-mvc switch components a mounted on an L-shaped bracket. The sh hole is measured identical to those for t dividers. Mount the switch as close to t 12AT7 as possible.

Dual type trimmers for oscillators and mix were used because they were readily availal and convenient to mount. If singles are us mount the mixer trimmers on the seco divider and mount the oscillator trimmers the first divider. There should then be a along the top of the first divider.

Make pencil marks through the holes, th drill and mount.

The two dividers are mounted on the chass Be sure the bandswitch shaft is at right ang to the panel to prevent binding. Line up t

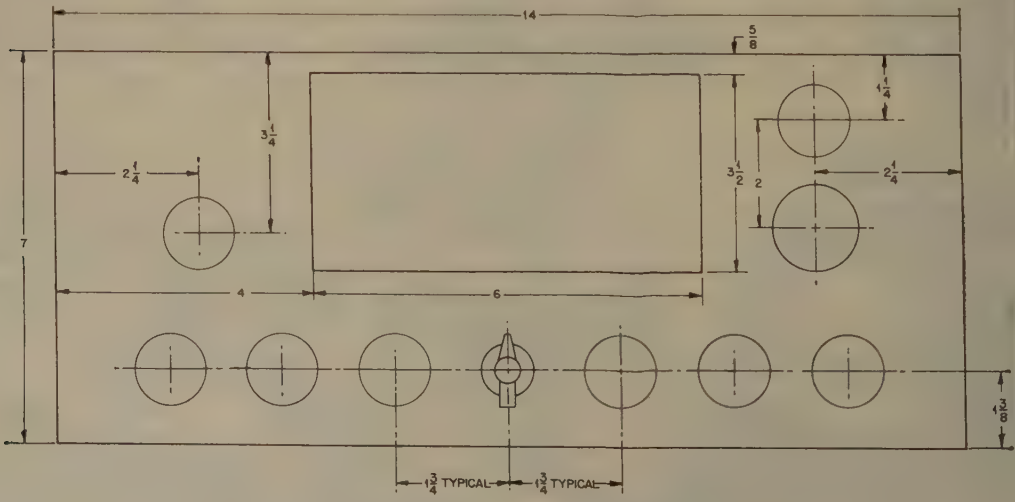


Fig. 1—Front panel layout for the super super.

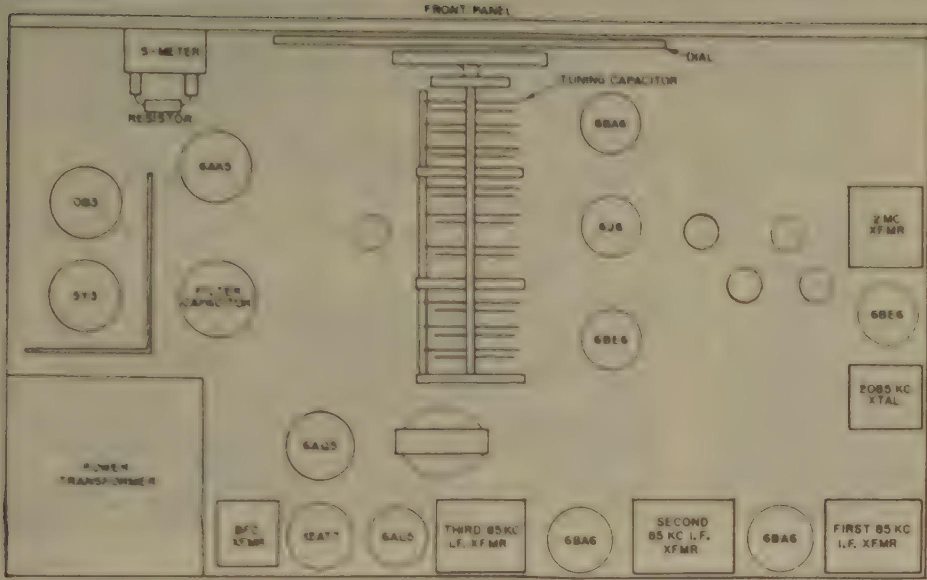


Fig. 2—Top view of chassis.

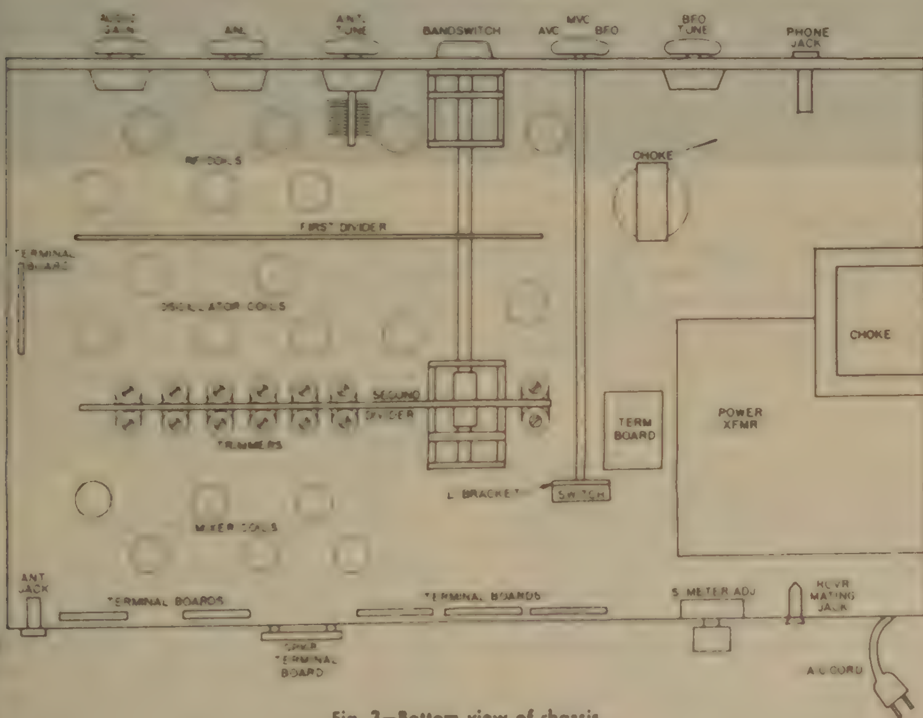


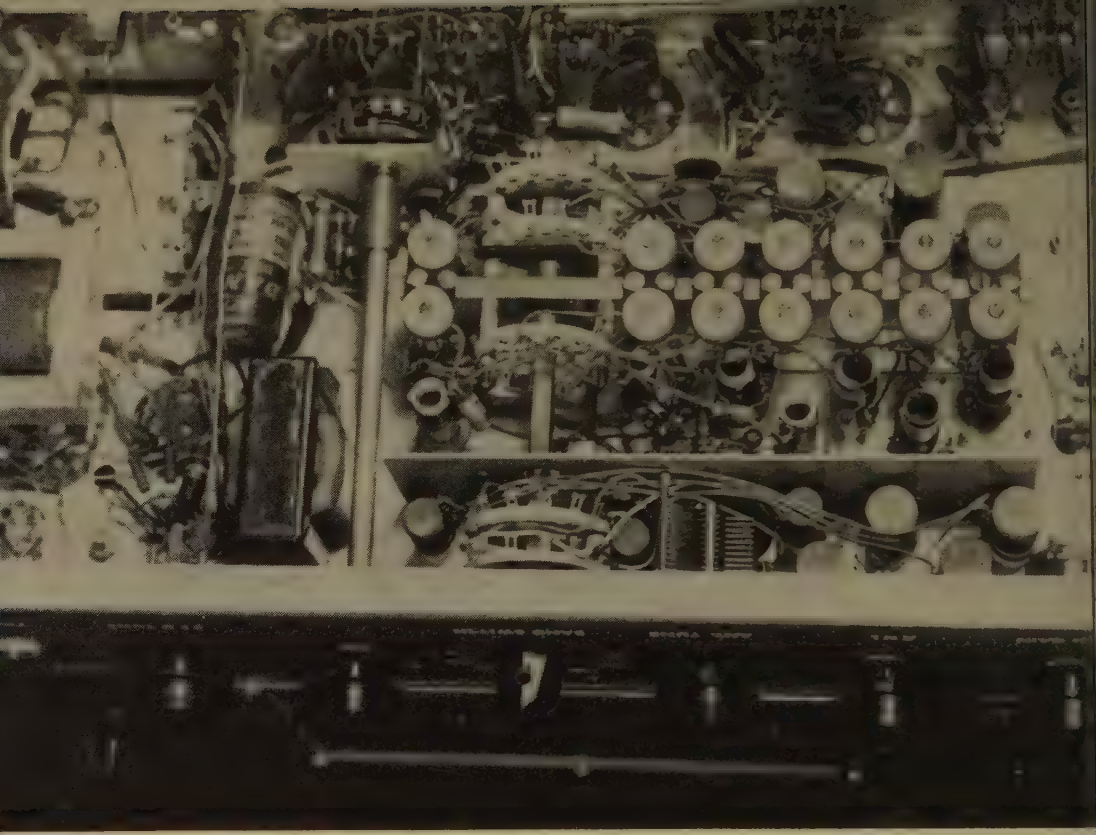
Fig. 3—Bottom view of chassis.

les, drill, and mount with bolts and nuts. e four mounting holes in the lower lip of ch divider. The first divider should be about f way between the panel and the second vider.

Mount the L-shaped bracket on the bfo-avc-c switch at the same time. Be sure the shaft at right angles to the panel.

Mount the power supply filter chokes where there is room. One went horizontally at the side of the chassis, the other vertically on the bottom.

Most of the resistors are mounted on eight small terminal boards taken from a Command set BC-453 receiver, but there was no room for an oscillator or mixer board. Mount the boards close to their respective tubes for short leads.



Components located on the back of the receiver chassis can be placed in the available space after the terminal boards are mounted.

Avc, cathode, screen, and plate bypass capacitors are all mounted directly on the tube and i-f transformer connections to assure short connections.

Wiring

All filament leads are wired with #18 stranded wire to handle high current. The balance of the wiring was telephone company switchboard scrap wire. Standard RETMA color coding was used.

First, wire the ac and power supply circuits. Shield with metallic braid, all long audio leads to the volume control, automatic noise limiter switch, and phone jack.

Filament leads are next. One side of the filament is grounded on a lug at each tube, the other side is run directly to the power transformer, as shown in fig. 5.

Then in order, wire the power amplifier, first audio, bfo, detector, avc, anl, first i-f stage, and second i-f stage.

Time to Test

Check B+ to B– with ohmmeter. Readings should be no lower than 50,000 ohms.

Turn the power on. The filament and volt regulator tube should light. Check with a v meter to see if plate and screen voltage present on all tubes wired so far. This sho be approximately 220v plates, 100v scre with the exception of the 6BE6 second c verter screen which should be approxima 20v dc.

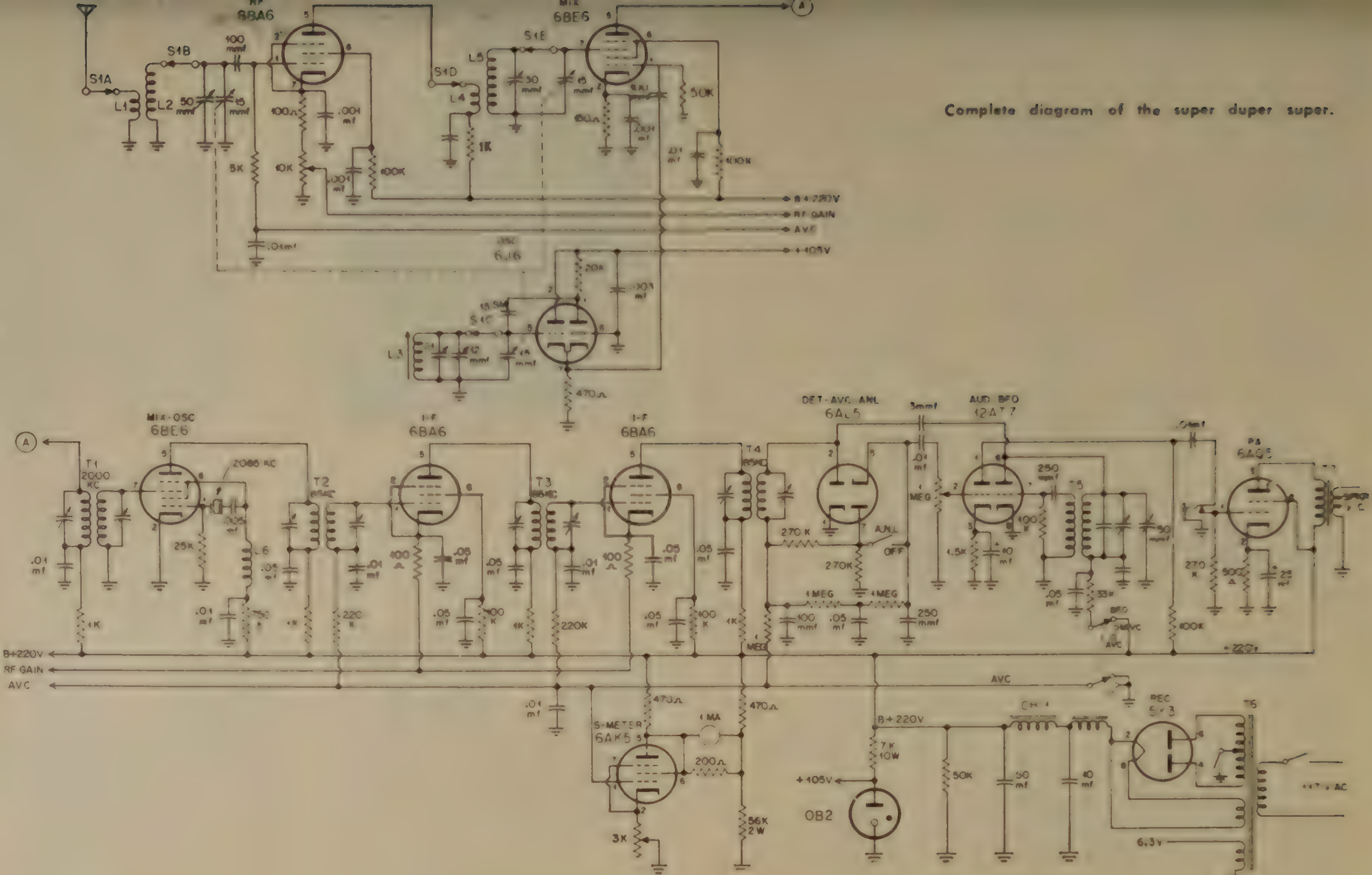
If all checks out, wire the S-meter circ The S-meter is a valuable aid in later test and adjusting of the receiver.

Apply the First Signal

Connect a signal generator to the primary the 2 mc i-f transformer through a 10 mm mica capacitor and hook up the speaker to receiver. Feed in a 2 mc modulated sig With the gain on the signal generator w open, the 2 mc i-f can is adjusted for maxim S-meter reading. As the meter is peaked, signal generator gain should be reduced.

The three 85 kc i-f transformers are justed in a similar manner.

Tune the signal generator back and fo across the i-f frequency. If the S-meter sh more than one peak, one or more of transformers are not tuned to resonance should be retuned. Normally, the signal car heard through the receiver when the gain the signal generator is turned almost all



Complete diagram of the super duper super.

	6 METERS	10-METERS	15-METERS	20-METERS	40-METERS	80-METERS
L_1						
Turns	3	5	7	6	8	15
Wire Size	#26	#26	#26	#26	#26	#30
Spacing of Turns	Wire diam.	Wire diam.	Close spaced	Close spaced	Close spaced	Close spaced
Spacing From L_2	Wire diam.	Wire diam.	1/16″	⅛″	⅛″	⅛″
Wound On L_2 Bottom	Yes	Yes	Yes	Yes	Yes	Yes
Form Diameter	⅜″	⅜″	⅜″	½″	½″	½″
Form Length	1¼″	1¼″	1¼″	1¼″	1¼″	1¼″
Length of Winding	3/16″	3/16″	3/16″	3/16″	3/16″	3/16″
L_2						
Turns	5	9	12	14	33	60
Wire Size	#26	#26	#26	#26	#26	#30
Spacing of Turns	Wire diam.	Wire diam.	Close spaced	Close spaced	Close spaced	Close spaced
Spacing From L_1	Wire	Wire	1/16″	⅛″	⅛″	⅛″
Wound Above L_1 On Same Form	Yes	Yes	Yes	Yes	Yes	Yes
Length Of Winding	½″	½″	½″	½″	⅞″	⅞″
L_3						
Turns	6	8	11	18	27	40
Wire Size	#26	#26	#26	#26	#26	#30
Spacing Of Turns	Wire diam.	Close spaced	Close spaced	Close spaced	Close spaced	Close spaced
Ceramic Iron Slug Form	Yes	Yes	Yes	Yes	Yes	Yes
Form Diameter	¼″	⅜″	⅜″	⅜″	⅜″	⅜″
*C_1 Silver Mica	None	15 mmf	10 mmf	30 mmf	45 mmf	15 mmf
L_4		Same as L_1				
L_5		Same as L_2				
L_6		1 Pie of 2.5 mh RF choke with turns removed to resonate at 2085 kc.				

PARTS LIST

Quantity	Capacitors
9	0.01 mfd 100 VDC Disc
8	0.05 mfd 400 VDC Disc
1	005 mfd 400 VDC Disc
3	001 mfd 400 VDC Disc
1	003 mfd 400 VDC Disc
1	100 mmf mica
2	250 mmf mica
1	15 mmf silver mica
1	10 mf 100 VDC Electrolytic
1	25 mf 100 VDC Electrolytic
1	10 mf 400 VDC Electrolytic
1	50 mf 400 VDC Electrolytic
1	3-section variable capacitor 25 mmf/section (BC-1206)
1	50 mmf variable ANT. TUNE
1	25 mmf variable BFO TUNE
6	3 to 12 mmf trimmers NPO (Osc)
6	5 to 30 mmf trimmers N750 (Mix)
1	3 mmf mica
	Coil Forms
1	¼″ iron slug core, ceramic
5	⅜″ iron slug core, ceramic (1 more if MARS band used)
6	⅜″ by 1¼″ polystyrene rods
6	½″ by 1¼″ polystyrene rods (2 more if MARS band used)
	Resistors
1	115K ¼ watt
6	100K ¼ watt
3	100 ohm ¼ watt
5	1K ¼ watt
1	150 ohm ¼ watt
1	20K ¼ watt
1	470 ohm ¼ watt
1	25K ¼ watt
1	750K ¼ watt
2	220K ¼ watt
3	270K ¼ watt
3	1MEG ¼ watt
1	1500 ohm ¼ watt
1	33K ¼ watt
1	500 ohm 1 watt
2	470 ohm 1 watt
1	200 ohm ¼ watt
1	56K 2 watt
1	50K 25 watt
1	7K 10 watt
1	3K WW 1 watt Pot
1	1MEG Pot Audio Taper with Switch
1	10K Pot WW 1 watt
	Resistor Boards
8	
	Tube Sockets
10	7 pin min. tube sockets
1	9 pin min. tube socket
1	8 pin min. tube socket
	Crystal
1	2085 kc crystal in small can
	Switches
1	2-pole, 3-position with 8″ shaft and ¼″ couplin
1	SPST rotary
1	7-position with 7″ shaft and ¼″ coupling
5	1-pole, 7-position ceramic wafers
	Other Parts
1	2 mc i-f Transformer
3	85 kc i-f Transformer (from BC-453)
1	85 kc bfo can (from BC-453)
1	2 watt output transformer
1	power transformer, 300v 90 ma 5v 2a, 6.3—4 A.
1	S-meter, 0-500 M amp
2	2H 70 ma choke
1	closed circuit phone jack

Chassis 7″ by 13″ by 2″ aluminum (BUD or ICA)
Panel 7″ by 14″ steel (BUD or ICA)
Cabinet 7″ by 14″ by 8″ (BUD or ICA)

way down.

Wire in the 6J6 first converter oscillator.

NOTE: The procedures that follow will be used to construct and test each band.

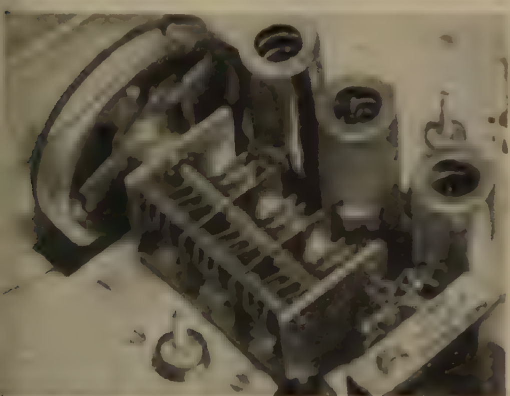
The six-meter band oscillator is wound as indicated in Table I. It can be hand wound on a ¼" diameter ceramic slug.

Install the coil as close to the 6J6 as is practical. Turn the power on again and check the tuning of the oscillator by listening on an accurately calibrated receiver or with a calibrated wave meter. It should tune from 48 mc to 52 mc.

If the oscillator tunes too high, adjust the iron slug in the oscillator coil to bring the frequency down. If this does not put the oscillator on the right frequency, some fixed capacitance may have to be added by cut and try method (with small capacitors), or by adding more turns to the coil.

If the oscillator tunes too low, try adjusting the iron slug. If this is not enough, spread the turns on the coil form. If still not enough, try removing one or two turns and retuning.

When the oscillator tunes the right frequency, it is time to wire the mixer. Mixer coils were wound on polystyrene rods according to Table I. Cut the rods to the right length, as given in the table. Also find the brad spacing as determined by the length of the winding listed, and find the space between coils if more than one is to be wound on one form.



Tuning condenser showing the plates retained. Behind, from left to right, are the 6BA6, 6J6, and 6BE6

These rods were tapped for 4-40 screws for mounting. Then tin and sink coil holding brads in the rod. Avoid using small-diameter drills for brad holes, as they may easily be broken (see "They Melt" in this issue, for an easy system). With reasonable care, there should be little trouble with larger drills for the mounting tap.

Leave the head of the brads about 1/16" above the rod. Scrape insulation from the end of the wire and wrap the wire around the brad. Solder them quickly so the polystyrene is not heated too much.

If a coil does not require many windings you may twist the rod with one hand and feed the wire with the other. If many windings are needed, insert a screw stud in the tapping hole and tighten a hand-drill on the stud. Put the drill handle in a vise. Turn the drill crank with one hand and feed the wire with the other.

NOTE: Don't answer the phone half way through or you'll have to start over again for sure!

Cut the wire at the correct number of windings, and hold the coil tight so it doesn't unwind. Remove insulation from the end of the wire, wrap it around the brad, and solder quickly as before. When through, paint all coils with coil dope.

Test the wired 6BE6 first converter with a voltmeter to see if the plate voltage is 200-250v and screen voltage is 80-100v. If ok, the mixer should be tuned.

Connect the signal generator to the plate of the 6BA6 through a 10 mmfd capacitor. Use minimum gain to get sharpest tuning. Feed in the signal at 50 mc and tune the receiver until the signal is heard through the speaker and seen on the S-meter. Adjust the trimmer capacitor for maximum S-meter reading.

Set the signal generator at 54 mc and repeat the procedure above but at 54 mc.

NOTE: S-meter reading for 54 mc will be different from the 50 mc reading. But if the 54 mc reading is *very* low, readjust according to "Readjusting Mixer Trimmer", in this issue. When the mixer stage is satisfactory proceed to the rf stage.

Wire the rf stage. Test by feeding a generator signal into the antenna jack through a 10 mmfd capacitor. Check at 50 mc and 54 mc as for the mixer, above.

RF coils are wound on polystyrene rods identical to those of the mixer, as given in Table I. Do not worry about critical adjusting as with the mixer. This is done with the variable capacitor called **Antenna Tune** on the front panel.

The six-meter coil is mounted closest to the 6BA6 and bandswitch wafer S1b to eliminate long leads.

Other Bands

Use this outline for each band:

1) Oscillator is tuned to the frequencies given in Table II using another receiver to pick up the signal.

2) Mixer is tuned to the frequencies given in Table II. If adjustments are needed, see "Readjusting Mixer Trimmer," in this issue.

3) RF stage for each band is wired and tested.

[*continued on page* 153]

A 4CX1000A Linear Amplifier

(A Calm, Cool, Casual, Kilowatt)

Irwin R. Wolfe, W6HHN
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Palo Alto, Calif.

This is an age of specialization! As in other fields, the trend in the electronics industry towards specialization has become more and more evident in recent years. It permits a higher degree of efficiency for a device and is often less costly and more compact than a general purpose item.

In amateur communication equipment this trend is noticeable in the greater popularity of the amateur band receiver over the general coverage types. There are also many power amplifiers being marketed that are designed for linear operation only. These amplifiers all use general purpose tubes with operating values adjusted for class AB operation. In conforming with the general trend toward specialization, the 4CX1000A has been designed specifically for use as a linear amplifier. It is a high perveance tube requiring rather low plate voltage for efficient performance. This permits a saving in high voltage power supply component costs and minimizes high voltage insulation problems.

This tube was found to have good linearity characteristics, was easy to drive and had more than adequate rated anode dissipation for maximum power operation.

It is an external anode ceramic tube that is half the size of a general purpose glass tube of similarly rated anode dissipation. The 1000 watt linear amplifier described here, was built to use this tube solely as a SSB amplifier. The components for the amplifier and the power supplies were selected to handle the actual power requirements encountered with SB voice modulation. This, incidentally, permitted using lower wattage units than would be necessary in other modes of operation since the power duty cycle of voice transmission is less than 50 of sine wave modulation.

The grid can be driven directly from a sid band generator that can deliver about 25 wat It can also be driven by a very low (5 to watts) powered exciter through selectab tuned grid circuits. The compactness of t tube and components enabled the amplifier be built into a small enough unit to possib interest the high power mobile operators. separate power supply is used which connec to the amplifier through a multi-wire cab The amplifier is a comparatively light weig job and is smaller than the average commu cations receiver.

The output circuit employs the familiar network. The values were selected to obta a minimum Q of 12 at a tube load impedan of 1500 ohms and an output impedance 52 ohms. Fairly high values of input and loa ing capacitors were required. The input capa tor chosen was an extremely compact vacuu variable with a voltage rating of 5000 volts a a capacity range from 5 to 500 mmfd. T output loading capacitor is an air spaced va able with a maximum capacity range of 15 mmfd. At 3.5 mc a 1000 mfd fixed capacit is connected in parallel with the loading capa tor by the bandswitch.

The coil used in this circuit is made of ed wise wound copper ribbon. Adjustable ta connect from the coil to the bandswitch a the switch progressively shorts more of t windings as the higher frequency bands selected. The frequency range covers the am teur bands from 3.5 to 29.7 mc. A 52 ohm l pass filter and directional coupler are install between the loading capacitor and the co-ax

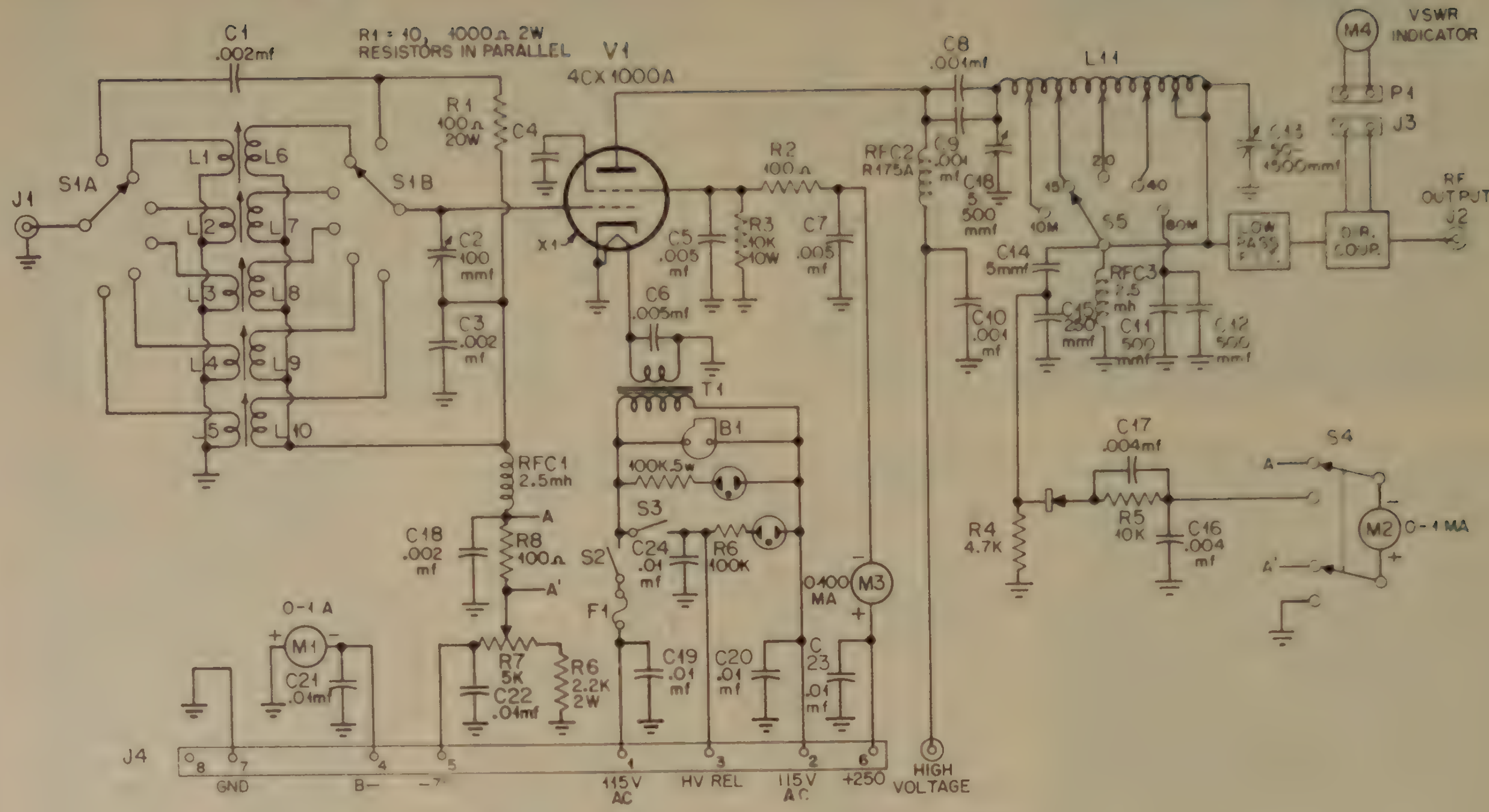


Fig. 1—Circuit diagram of a kilowatt final employing a 4CX1000A.

output terminal for the antenna. A shielded microphone type of receptacle on the rear of the amplifier is provided to connect to a SWR indicator.

As previously mentioned, the input circuit can be selected for either direct drive or through a tuned circuit bandswitch. In the direct drive position, the exciter voltage is capacitively coupled to the grid and a 100 ohm terminating resistor connects from grid to rf ground. In the tuned grid position, a band selector switch chooses any one of five slug tuned coils. These coils all have coupling links that connect to the rf input through the grid bandswitch. A 100mmfd variable capacitor is used to resonate the grid coils. The grid coils are of the miniature type, but are adequate, since very little power is handled.

Metering

Three meters are used, with one of them doing double duty. The plate and screen currents are continuously monitored. A 10,000 ohm resistor is connected from the tube socket screen terminal to ground. This will cause the screen milliammeter to read 25 to 30 milliamperes when screen voltage (250 to 300 volts) is applied. With low rf excitation the screen current becomes negative and the indicated screen current will go towards zero.

With increasing excitation, the screen current increases to a positive value and adds to the "resting" screen current. A switch selects the O-1 milliammeter to read either grid current or comparative amplifier output. In the GRID position, a one ohm resistor is placed in parallel to the O-1 milliammeter to increase its range to 5 ma. full scale. A sampling of the rf output is obtained by a capacity divider from the rf output to ground and this voltage (about 2 volts) is rectified by a germanium diode, filtered and applied to the O-1 milliammeter when the selector switch is in output position.

Controls

The lower left hand toggle switch marked ON-OFF, applies ac line voltage to the filament transformer and blower. It also applies line voltage to the bias and screen rectifier and to the high voltage rectifier tube filaments. A neon indicator lamp above the switch indicates when the switch is ON. The toggle switch to the right marked STANDBY-TRANSMIT, connects both the screen and high voltage to the tube when it is in TRANSMIT position. An indicating neon lamp above it lights when it is ON. The control to the right of the STANDBY-TRANSMIT switch is the grid tuning capacitor and directly above it, the grid coil band selector. To the left of the O-1 dc milliammeter, the selector switch connects the meter to read either Grid current c Output. To the right of the meter, a co potentiometer adjusts the grid bias voltag the proper plate resting current. The right of the panel has the controls for the pi-netv tuning. The vacuum plate tuning capacit operated by a counter type of dial and loading capacitor uses a friction type vernier dial.

The pi tuning coil switch is marked for bands from 3.5 to 28 mc. As can be seen f the photograph, the chassis containing tube and rf components is set back a inches from the front panel. The filar transformer and meters as well as the p control circuits are in this area and are shie from the rf field. An aluminum cover encl the top and sides to complete the amp shielding. The blower is attached to the ch containing the grid circuit and tube so Rubber is used in its mounting to re blower noise. With the base plate in place grid chassis is completely closed and is u pressure from the blower. The air esc through an air system socket designed for tube, cooling its base and anode. A chin helps directs the air flow directly to the anode cooling fins.

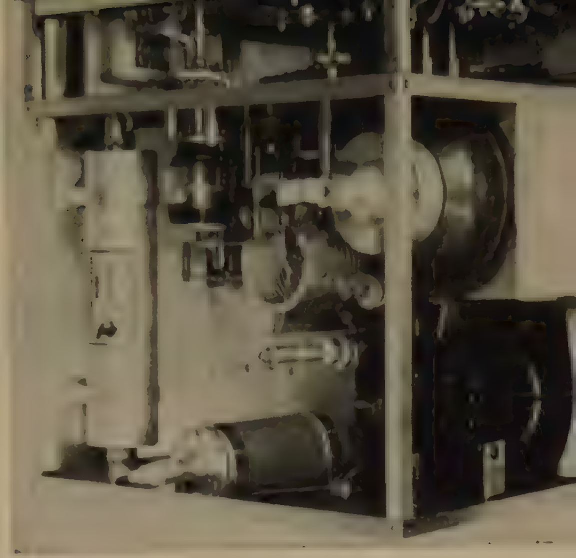
All power leads enter the chassis thro an eight terminal heavy duty receptacle at rear of the amplifier and are all by-passe ground there to minimize TVI.

Power Supplies

The power supplies for the amplifier built in two units. The high voltage suppl built into a 12½″ x 19″ panel and the r lated screen and bias supply is built int 7″ x 19″ panel. Both units are mounted a 21″ x 19″ cabinet which may rest on floor. Each supply has a dc voltmeter. A wire cable connects it to the Linear Ampli with the high voltage lead run separately a the multi-wire cable. The high voltage rect uses a pair of 866A rectifiers with a si section filter. The filter capacitor is made l enough to provide sufficient current sto for the peak current demands.

The power supply for the screen uses e tronic regulation and the voltage range is justable from 200 to 350 volts. The supply uses a line isolation transformer a half wave selenium rectifier. An LC filte used with a gas discharge tube for vol stabilization. Overload protection is prov by an over current relay in the negative re of the plate transformer to ground. This r is shunted by a rheostat that may be adjuste make it operate at any pre-determined cu value. The screen, bias and high vol primary circuits are all fused. A 30 ma ble is connected from the high voltage to gr to keep the filter capacitors discharged

[*Continued on page 151*]



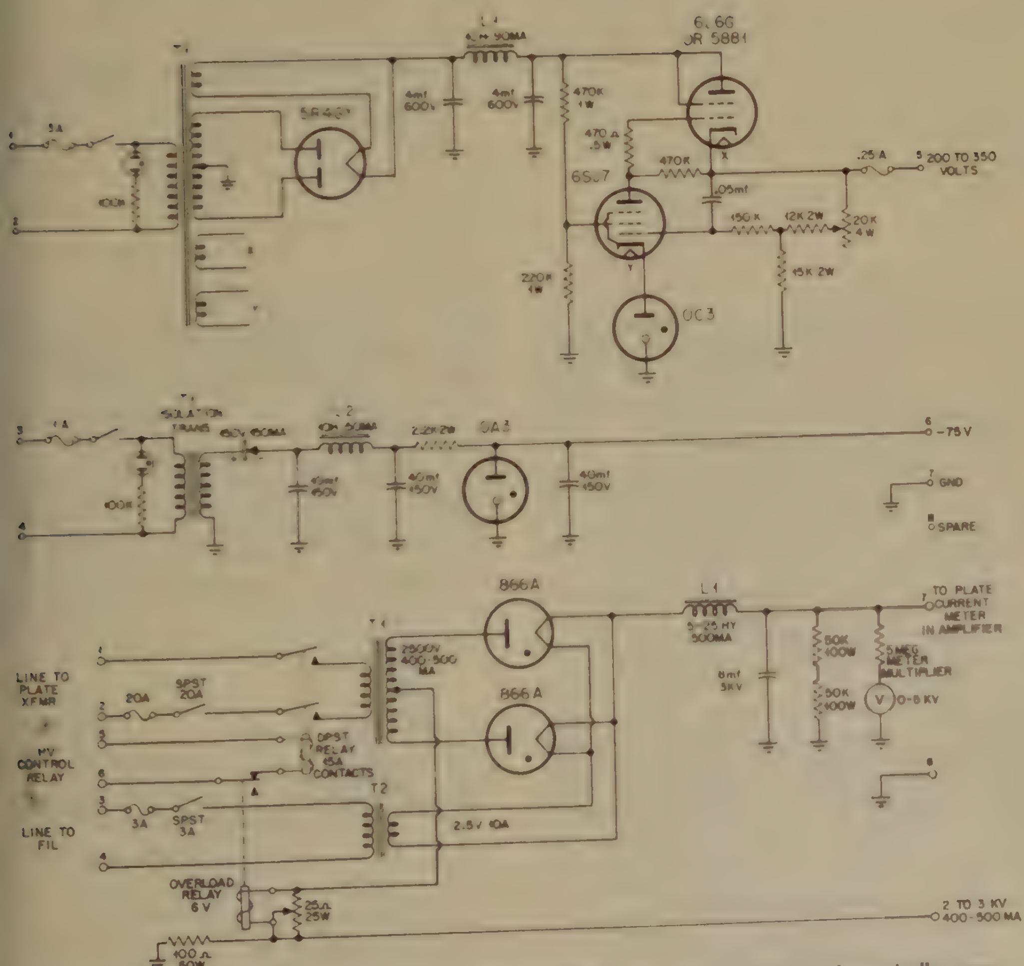


Fig. 2—Circuits of the screen, bias and high voltage supplies. The screen supply is electronically regulated and the bias supply is stabilized. The high votage B minus and B plus terminal designations are reversed. (#7 & 2-3 KV)

An Allband Attic Antenna

Here is a bright ray of hope for the amateur who can't erect an outdoor antenna and wants to work all bands.

Cdr. Gay E. Milius, Jr., W4NJF
3445 S. Wakefield Street
Arlington 6, Virginia

"Yes, Joe, I'm using an antenna in the attic . . . thanks for the compliment on the signal, Joe . . . this affair works on 10, 20, 40 and 75 . . . yes, I said 75 too . . . guess I could have built in 15 if I had wanted to . . . how's it made? . . . well, it's like this . . .:"

It's an inverted V on 20 meters, trapped and extended to look like a duck's wishbone on 40. It's further trapped and extended to load on the high end of 75 and it's fed with 75 ohm twin lead through a Johnson Matchbox.

Although this attic antenna was designed on paper by W3FZ and W3WXA to work on 20, 40 and 75 meters, I discovered later that it loads and functions fine on 10 meters. But I don't know why.

As all attics vary in size and shape the physical length of the wire is peculiar to my situation and won't be discussed here. However, the method of construction, tuning, and the traps should not differ from one installation to another. The traps act as insulators for their respective frequencies. They also shorten the physical and electrical length of the antenna while the overall length is further modified by the angles which you will have to put in the wire to get it in the attic.

I started by stringing a 20 meter dipole, using 7-22 bare antenna wire, parallel to the rafters at one end of the attic (fig. 1). The feed point was placed directly under the ridgep The result was an inverted V. I used pieces lucite as temporary insulators while in center I attached the wires to a coax fitt set in the center of a piece of poly (fig. 2). the preliminary feed line of RG 59/U, wh ran to the Johnson Matchbox, I inserted SWR bridge. In the coax between the Match and the rig I placed another SWR bridge.

(From many experiments in working w attic antennas I have learned that the use c

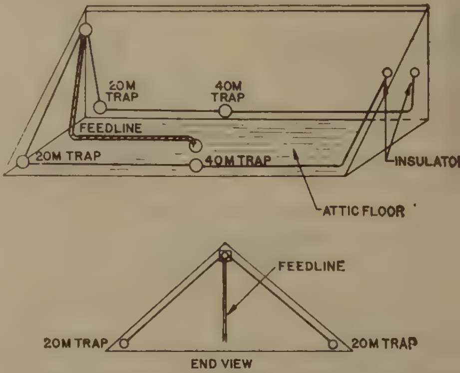


Fig. 1

rid-dip meter with or without an antennascope not very satisfactory. It is usually difficult reach the center of the antenna, the prox- ity of surrounding matter may cause unbal- nce, and the grid-dipper must continually be hecked against some frequency meter or a ell calibrated receiver.)

By patiently trimming the antenna I chieved a flat line as indicated on both ridges. Incidentally, I did not cut the wire. folded it back so that it could be extended ter if necessary. I found that when the an- nna was a certain length both lines would be at at the desired frequency. As soon as this ngth was reached I replaced the temporary sulators with traps.

The traps are inductances parallel tuned for 4.150 mc. I started making them by hacksaw- g a section of ten turns from an Airdux 06T coil (fig. 3). One turn at either end I sed as leads. I used a piece of poly about 4½ ches long and a little less than 2 inches wide r the supporting insulator. A piece of poly d 1 inch in diameter and 4½ inches long will o. I bored two holes at either end of the poly: ne about ½ inch from the end and the second bout ¾ inch from the first. The outer holes re larger than the inner holes because the an- nna wire is fed through them to make con- ection with the trap. Then I inserted the leads om the coil into the inner set of holes and ent them under and through the outer holes. laid a 37 mmfd capacitor, 3 KV (or higher ating for power over 200 watts), on the sup- orting insulator, inside the coil, and soldered it cross the coil. With the hacksaw I carefully osened ¼ turn of the coil on each end so at it could be bent outward for fine adjust- ent (as shown in fig. 3).

It proved necessary to place the trap in a ear spot away from any metal when grid- pping it for the center of the 20 meter band. or close adjustment I bent outward the free nd ¼ turns. For the second trap I made a hinese copy of the first. When finished, they ad 7½ turns.

With the 20 meter traps attached, I checked e array for 20 meters. There should have een no change in the previous loading adjust-

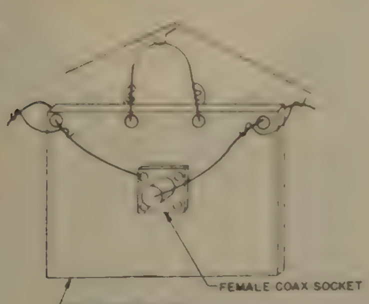


Fig. 2

ments at the Matchbox or transmitter. And there were none! So I added about 10 feet of 7-22 wire to each of the traps and stretched it out, being careful not to make sharp bends. (All the bends were made with a radius greater than 4 inches.) I adjusted this system for the center of the 40 meter band by shortening the wire I had added. The 40 meter section coming at right angles to the 20 meter inverted V and parallel to the attic floor gave the duck's wish-bone design.

When the 40 meter section was adjusted I added the 40 meter traps at either end. They are fashioned in the same manner as the 20 meter traps. I cut a section of Airdux 2408T coil about 13 turns. The insulator was made the same size as before. This time I used a 47 mmfd capacitor. The finished coil emerged as 11 turns. I grid-dipped it and set it for the center of the 40 meter band. A Chinese copy was easy to construct.

With the traps in place I tested the antenna on 40 meters. Again, there should be no change in adjustments if the traps were tuned correctly, and, again, I found none. I guess I was lucky.

Next, I added to each 40 meter trap one half of the remaining wire from my original 100 foot roll of 7-22 and stretched it around the attic fastening an insulator at the ends. Don't worry, you probably will have too much wire anyway because I found that I had to fold up almost 4 feet from either end to bring the resonance from 3.56 mc to 3.95 mc.

(Will some genius devise a means for me to add more wire when I want to QSY down to the lower depths of 80 meters? I'm tired of continually climbing up into the attic to unfold the ends of this antenna.)

When I had the entire thing adjusted to my satisfaction, I crossed my fingers and replaced the coax with 75 ohm transmitting twin-lead. (It was simple to solder a male coax fitting to the end of the twin-lead.) I was anxious to effect a balanced feed line to the Matchbox. Apparently I achieved my goal as I found no difference in loading and I cannot light neon bulbs on the feeders.

This antenna is quite broad on all bands except 75 meters. It has resulted in many contacts which I'd not have been able to make with other clumsy indoor devices. I was really intrigued when it loaded across the 10 meter band and worked out well although quite directional broadside. I surmise that if someone wanted to include 15 meters he cauld do so by starting with a 15 meter dipole and inserting 15 meter traps before the 20 meter traps. ■

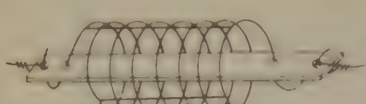
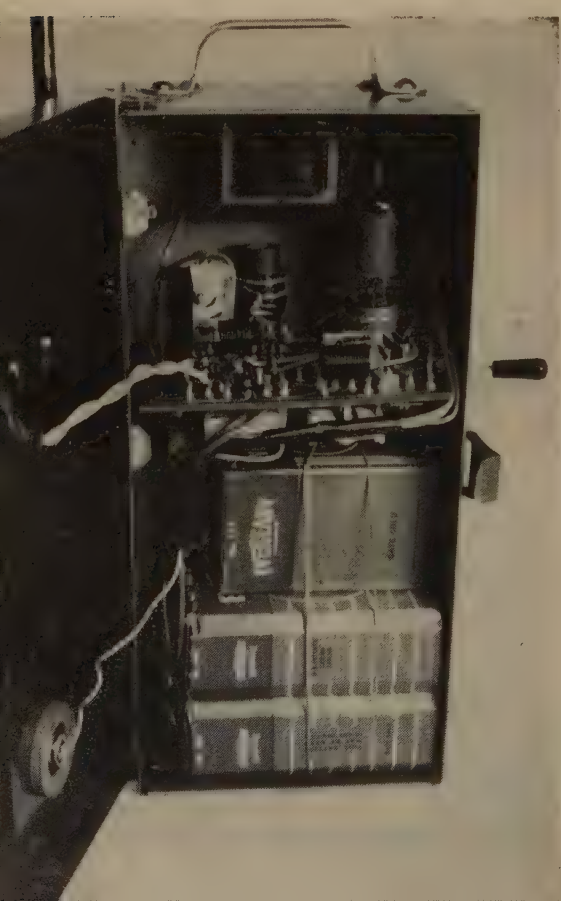


Fig. 3

One tube walkie-talkie

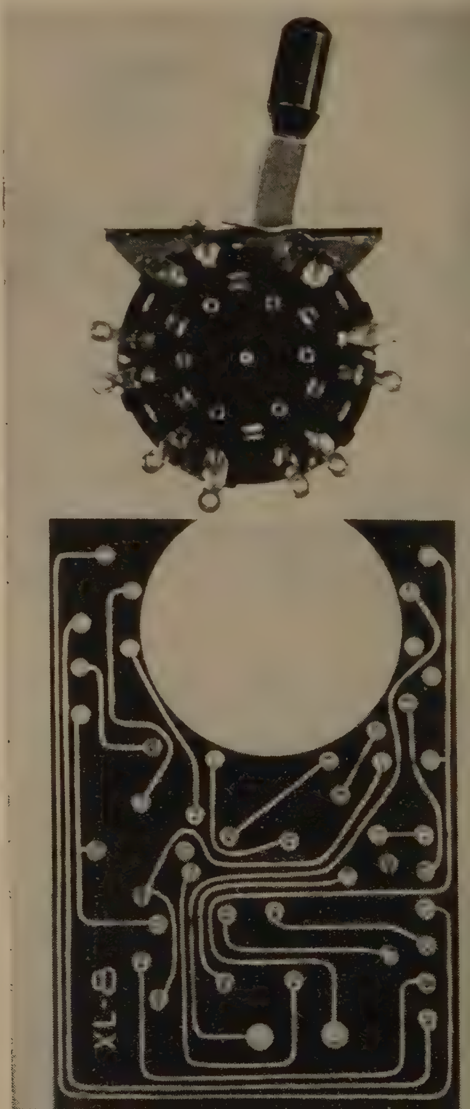
Anthony J. Kalilich, W8WLM
Box 2236
Cleveland 9, Ohio

Let's go portable! Here is a easy to build portable Walkie-Talkie unit using one tube, with approximately a 3 mile range on 10 meters. This unit is a separate receiver and transmitter Walkie-Talkie using only one tube which is manually switched from one circuit to another with the use of a 6 pole, 2 position lever or rotary switch. The switch is mechanically mounted on a 3″ X 4″ printed circuit board, which contains the circuitry and mounting supports for the necessary parts to comprise the main section of the unit.



Transmitter

The transmitter circuit is the equivalent : an xtal controlled tri-tet oscillator-frequen doubler, in this case operating on 10 mete



20 meter xtal is used, which is doubling to 0 meters in this unit, however, a 40 meter tal can be used, and the frequency quadrupled own to 10 meters with just as good results. o operate on 6 meters, the unit would double, sing a 25 megacycle xtal for best performance. o change bands, the cathode coil, and the late coil would have to be changed and the ntenna shortened. Modulation is accomplished y varying the suppressor grid voltage. The rid being biased 7.5 volts negative, with the econdary of the mike transformer connected n series, adds and subtracts from this bias oltage, thereby resulting in modulation of the arrier. This method provides ample modula- on for this unit, with good quality.

Receiver

The receiver circuit is a super-regenerative elf-detecting unit, one of the most sensitive eceiver circuits known. The ear phone is used s the plate load of the tube, thus it should be at least 1000 ohms or more to operate properly. The microphone is a standard F-1 cartridge. If it is desired to operate a mike handset instead, a phone jack can be mounted on the box and a fixed plate load of 1000 ohms or more can be used, and capacity coupled to the ear phone. The mike circuit can be the same, but a shielded cable should be used with this arrangement.

The regeneration control is a 1 meg pot with a DPST, switch (S2&S3) mounted on the back of the pot (R-3). This switch turns the unit on and off.

The receiver coil is wound on a ½" form, (close-wound), with the feedback coil wound over it, so that the plate and the grid ends of the coils are over each other. These coils are wound in the same direction and in phase with each other, thereby causing the circuit to oscillate.

The antenna link coil is loosely wound over the coil form so that it can be moved up and down the coils for the best performance.

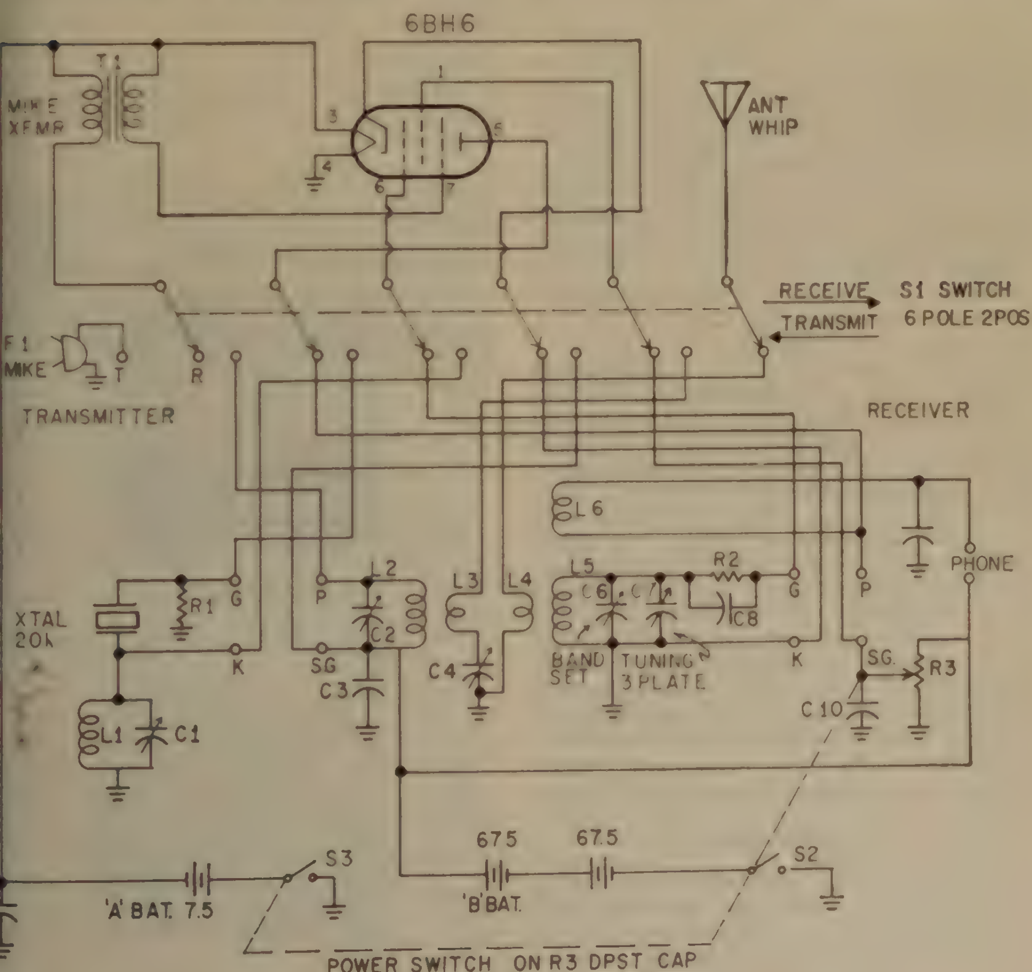


Fig. 1

Parts List

Resistors
R 1—22K ½ w
R 2—2.2 Meg. ½ w
R 3—1.Meg. Pot (Centralab # B-69)
Capacitors
C 1, C 2, C 4, C 6—5-50 mmfd trimmer
C 3, C 5, C 8—500 mmfd Mica 200 volts
C 7—5-25 mmfd variable 3 plate
C 9—100 mmfd Mica 200 volts
C10—.001 mfd 200 volts
Switches
S 1—6 pole 2 pos. Mallory Switch-Lever #7262L or Rotary #3263J
S 2, S 3—Power Switch DPST, mounted on R 3 Pot. Centralab #KB-2
Components
T-1 Microphone Transformer Stancor A-4747 or equivalent
F1 Carbon Microphone or equivalent
Earphone—1000 ohms or more
Antenna—3 Section car whip—approx. 66 inches long
Xtal—20 Meter (See Text)
V1—6BH6
"A" Battery—7.5 volts (Eveready #717)
"B" Battery—(2) 67½ volts (Eveready #467)
Metal Box—4½ x 3 x 9½
Dial Plates—Mallory Switch index 0-10
Knobs—Mallory Pointer type
Battery clips—
Decals -1 inch gold transfer type
Etched Printed Circuit Board—XL-8 Special See Te

Coil Data

10 Meters

L1—18 Turns ½" Dia. #24 Enameled
L2—10 Turns ½" Dia. #24 Enameled
L3— 4 Turns #24 Enameled, wound on L2 (Cold E
L4— 2 Turns #24 Plastic covered wound on L5 (L wound)
L5— 8 Turns ½" Dia. #24 Plastic covered—close wo
L6— 4 Turns #24 Plastic covered wound over I windings in same direction—close wound

6 Meters

L1—10 Turns ½" Dia. #24 Enameled
L2— 6 Turns ½" Dia. #24 Enameled
L3— 3 Turns #24 Enameled, wound on L2 (Cold E
L4— 2 Turns #24 Plastic covered wound on L5 (L wound)
L5— 6 Turns ½" Dia. #24 Plastic covered—close wo
L6 - 3 Turns #24 Plastic covered wound over I Windings in same direction—close wound.

The switch and printed circuit board are avail from the author.

The tuning condenser serves as a band-spread control, since it is in parallel with the trimmer condenser (C6) which sets the band you are to receive, thus making it easier to tune and hold signals in. (Note: For receiving 6 meters, the tuning condenser (C7) shoud be changed from a 3 plate to a 2 plate variable condenser, thereby improving the band-spread action of the unit.)

Switch

The lever or rotary switch is a 6 pole, 2 position switch which serves to transfer the tube from one circuit to another along with the antenna. The switch transfers the grid, cathode, plate and the screen grid of the tube and antenna, and closes the mike circuit when in transmit position. (Note: The bottom of the lever switch (case) serves as the common ground when connecting and wiring components to the printed circuit board.) When using the rotary switch (3263J), it must be indexed for 2 position, and the lugs on the switch must be selected for proper placement on the printed circuit board. The switches discussed are Mallory, lever type *7262L* and the rotary type *3263J* (a 3 pos. 6 pole). The lever switch is a spring action type, resting in the receive position when connected in the unit. (See end of text)

Printed Board

The printed circuit board serves as the chassis for the unit's construction, containing 80% of the wiring, and provides easy mechanical mounting for the components used. The printed circuit was designed to mechanically support the transmit-receive switch (S1) and directly make and break the circuitry for switching tube from the receiver circuit to the transm ter circuit.

Front view of the Walkie Talkie showing the ante mounting method and positioning of the T-R Swi

The mounting of the switch and the com-
onent parts on the printed circuit board is
one on small pin stakes crimped to the cir-
uitry of the board. All parts are soldered to
hese stakes, and through the stakes connect
irectly to the printed circuit, eliminating wir-
ng and unnecessary capacity in the circuit. The
rinted circuit insures a stable fixed circuit
nd eliminates trouble with loose connections
nd makes the unit less susceptible to hand-
apacity or detuning. (Car must be taken when
oldering, that no solder is splashed on the
rinted wiring.)

The circuitry on the board is plated to make
ood contact and resist corrosion, when sol-
lering and mounting the parts. The only wiring
lone on the board, is connecting a few jump-
r leads to complete the circuitry of the trans-
nit-receive switch, and the insertion of leads
rom the remote parts, such as the battery,
nike, ear phone and transformer. The board
s supported in the metal box by the switch
receive-transmit) and the tuning controls
nounted on the front of the unit.

Another purpose of the switch is to provide
a mounting for the tube socket and make pos-
sible the switching of the tube elements to
ither circuit. The contacts on the switch are
lesigned to support the tube, thus reducing
ead length.

All coils and parts are mounted on the top
side of the printed circuit board, with only
he trimmer condensers and a few small parts
nounted on the underside. The trimmer con-
lensers are placed on the bottom side of the
board for ease of tuning the unit. To do this,
he batteries are removed, and placed outside
of the box, and using a small insulated screw-
driver, the unit is set in the band (receiver)
and the transmitter tuned.

Construction Information

The photo shows the construction of the printed circuit board (XLB) with the pin stakes crimped in position for mounting the parts. The top side of the board shows the cut-out, 1¼ inch dia. hole, and mounting stakes around the hole, which support the switch (S1) and make electrical contact to the leads on the printed circuit.

Xtal pins are phone tip jacks drilled out to enable xtal pins to fit, however, a xtal socket can be used instead and fastened to the board. The pin stakes used were Cambridge-Teriamic, which were turned over with a small hand swager to fasten them to the board.

The trimmer condensers used can be old i-f trimmers or padders from surplus gear. The tuning condenser (C7) is a 3 plate variable, which can be cut down from a larger one, and serves as a band-spread when tuning. The mike is an F-1 with a threaded screw carbon container, which was unscrewed and reassembled through the door of the metal box, thus making it self supporting plus a good electrical ground for the mike circuit. The ear phone is also mounted on the door of the box, but the mounting screws were changed to brass, otherwise the magnetic circuit of the phone would be shorted out through the box. **Brass screws** must be used to mount the phone.

The battery clips were used to make up the battery cable and a piece of plastic tubing was used to hold the cable together when routing it in the unit.

The metal box used was purchased from the local 5 & 10 for 89¢ and was intended for use as a small tool box. We suggest a metal box of some sort be used for this unit, thus insuring good shielding and easy tuning of the antennas. If trouble is encountered tuning the antenna, a small loading coil can be inserted in series. The antenna used was a 3 section car whip which extended to about 66 inches, and collapsed to 22 inches.

Tuning

Transmitter—The tuning of the transmitter is very simple. All that is needed is a communications receiver with an S meter. The cathode coil, plate coil, and the antenna circuit are all tuned using the "S" meter on the receiver, (no antenna on communications receiver), for maximum indication. If the S meter reads full scale, use rf gain control on receiver to reduce the reading, or back away from the receiver. All tuning adjustments for the unit are on the underside of the printed circuit. Retuning is necessary only if a great frequency change in the xtal is made, (from one end of the band to the other). An insulated screwdriver should be used for adjusting. (Be sure to extend the antenna to its full 66 inches.)

Receiver—The tuning of the receiver, and setting it in the band to receive, is also done with a communications receiver. Being of the super-regenerative type, of receiver, it must oscillate in order to operate. The communications receiver is set to the middle of the band, then, by tuning trimmer condenser (C6) of the super-regenerative circuit, we will radiate a signal that can be heard in the receiver. Having now set the receiver to the center of the band, the main tuning condenser (3 plate variable (C7)) will band spread and tune the entire band.

Conclusion

This unit has an approximate range of 3 miles on 10 meters and the range of the receiver is unlimited. It has been used on CD drills, hidden-transmitter hunts, Soap-Box Derby, Field-Day and parade activities locally. There are many more activities that one can adapt this unit to, and find pleasure in operating portable. ■

THREE-BAND INTERLACED BEAMS

Maj. R. H. Mitchell, W4RQR
Route 2, Box 80
Newport, North Carolina

Original installation in Japan.

After the construction—and successful ‹
eration—of a two-band interlaced rotary be
at W5DWT[1], one question kept bother
me. Others asked it too. "Why didn't you m
it a three-bander while you were at it?" T
only logical answer is that at the time of c
struction, considerable doubt was entertai
that the two-bander would be successful.[2]

Naturally, when the interlaced beam work
so well, there was considerably less questi
as to whether the three-bander would wo
About that time, I found myself on a lo
tour of temporary duty in Japan with the c
KA2EC, a portable kilowatt, a receiver, a
no antenna. The obvious move was the c
struction of the three-bander.

Procurement of materials in Nippon p
sented quite a problem, and the beam had
be a compromise. Eventually, two 14-foot 1½
X 3/16" dural angles and some badly be
tubing from a couple of old typhoon-damag

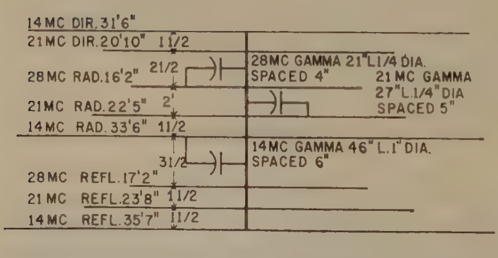


Fig. 1—The elements are constructed of 1½" tubing at the centers, tapering to 1" at the ends. Gamma capacitors of RG-8/U, 28 mc, 11"; 21 mc, 18"; 14 mc, 32".

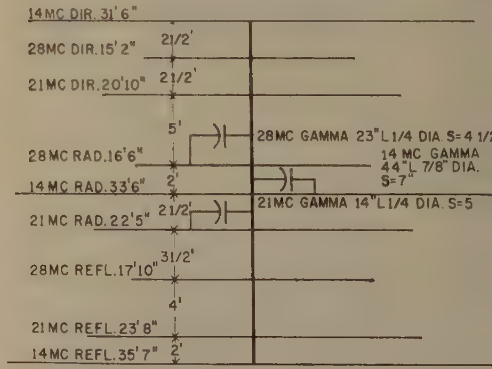


Fig. 2—The element construction for 14 and 28 mc; 1" tubing at the centers tapered to ⅞" at the ends. 21 mc, ¾" at the center to 5/8" at the ends. Gamma capacitors are of RG-8/U; 28 mc, 13"; 21 mc, 47"; 14 mc, 42".

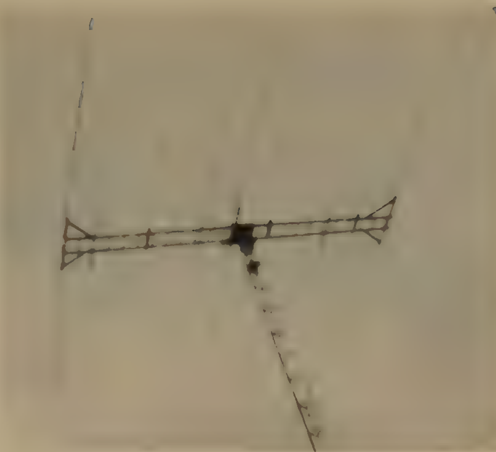
eams were found. After considerable straight-ning and splicing, enough tubing was avail-ble for sets of three elements for 14, 21, and 8 mc. However, the short boom necessitated y the fourteen-foot angles seemed to rule out he use of all nine elements. With the 14/21 ic beam, it had been found that about 1½ oot separation between interlaced elements was necessary to prevent interlocking loading nd s.w.r. fluctuations as the elements blew bout in the wind. We finally decided to try hree elements on 14 and 21 mc, and two on 8 mc. The layout shown in fig 1 resulted. The wo 14-foot angles were riveted together to orm the boom. One-inch aluminum angle rossarms were riveted to the flat surface of he boom to hold the elements. The crossarms were five-feet long for 14 mc, and three-feet ong for 21 and 28 mc. A three-foot pipe was mounted on top of the boom, and guy wires were run from the top of this to the outer ends of the outer crossbraces to add rigidity. Four-foot 1x2's were run from the boom to the ends of the crossbraces. Previous experience with this type of guying had proved that if something of this nature isn't done, the outer elements would soon be bowed in toward the center. Wooden braces were used in preference to metal because we weren't sure just how much the length of the elements would be changed by a large closed loop at the center of the elements.

The question of what element length to use was solved quite simply. We used our old formulas for the three-element beams: reflector 500/F; radiator=468/F; and director-444/F. For the two-element 28 mc section, element lengths were set to an *Editors and Engineers Radio Handbook* formula: reflector = 490/F; and radiator=462/F. (The reflector-radiator combination was decided upon for 28 mc in preference to the currently popular .1-wavelength spaced radiator-director arrangement, because it made a better boom arrangement.)

Gamma matches were decided upon because I prefer the coaxial-fed gamma to any other feed system. Plastic boxes were used for the housings for the receiving variables employed to tune out the gamma reactances.

Fortunately, while the beam was being built, a 45-foot pole appeared in a strategic spot, and a platform was built on it. The beam was raised into position and tuned. It was found necessary to increase the 14-and 21-mc radiators by a few inches, and to change the gamma lengths slightly, but the beams all tuned up beautifully. S.w.r.'s ran well under 1.5 to 1 across 14 and 21 mc, and dipped to 1 to 1 at 14150 and 21200 kc. On 28 mc, the s.w.r. was about 1.5 to 1 at 28 mc, 1 to 1 at 28.5 mc, and from 29 to 29.7 mc fluctuated be-

[*Continued on page 130*]



Two views of the new stateside job.

1. "20 and 15, Rotary," CQ, December, 1955.
2. "Design Notes on a Four-Band Rotary," QST, December, 1955.

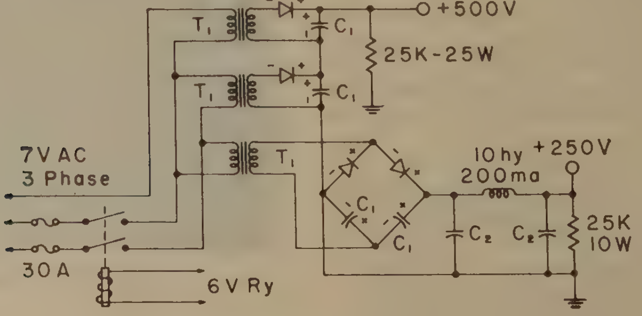
500 Volt Mobile Power Supply

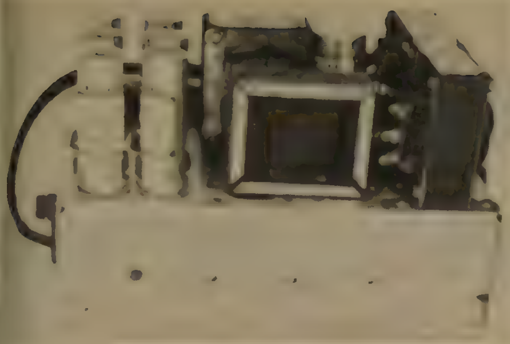
Howard W. Snyder W3LMC
39 Edgemoor Road
Timonium, Md.

The three phase power supply described in CQ, October 1955, by W81WG was too much to power my Elmac AF-67, but a few slight changes were all that was needed to make it ideal. I am still surprised to find so little interest among mobileers in using such power supplies. Maybe they are holding out for the transistor units now becoming available. They, in themselves, are not the complete answer, as the primary source of power is still a necessity. With an ac alternator it is very nice to know that the battery is no longer the limiting factor.

Yes, I know the engine must be running, b it need only idle and you can take your fo from the accelerator. So, I believe the troub or objection boils down to one thing, parti with the long green. But let's face it—ha radio is not exactly a poor man's hobby. The comes a time when the junk box or club au tion will not yield the wanted parts.

The alternators, second hand, are usua incomplete as to pulley size, mounting equi ment and too often the rectifiers and regulato are beyond use. But regardless of price, almo everyone will admit to their desirability. Ma





bargains may still be had. As inferred, the alternator must fit the car, so be sure you are able to mount it if you come across one for sale. Naturally, all the proper parts can be obtained through authorized dealers.

This article is not to show all the possible theory or hookups, but to show a supply that works nicely for an Elmac or similar mobile transmitter.

Forget your fears of voltage regulation as you step on the gas. The very thing that causes poor regulation works to your advantage. If efficiency were high, then voltage would soar as engine speed is increased, but due to an increase in eddy losses in the 60 cycle filament transformers, the voltage rises very little from that obtained at idling speed.

The circuit is simply two half wave supplies and a third full wave supply in series. This last supply will create an unbalanced load on the alternator but is not a serious condition. The transformer used there could stand some experimenting. But regardless of the engineering discrepancies, the supply is smooth, no trace of ripple and plenty husky as an Elmac cannot overload it.

Don't forget to observe correct polarity in connecting the transformers. Be sure to insulate all the condensers from the chassis, except those in the low voltage supply. The cans will be hot, so an insulated cover for them is a good idea. One easy way would be to wrap them with tape. The photograph shows six 150 mfd. 150 volt condensers, but two of them are not used as they are a hold-over from the original hookup using a full wave circuit.

The photographs also show the coaxial antenna relay used in my installation, as well as the dc control cable and connectors.

The selenium rectifiers can be the 400 ma TV variety or 250 ma units in parallel. The 5 x 3 x 10 inch chassis easily contains all the parts, including fuse holders, plugs, relays, etc. As in most power supplies, placement of parts and neatness of wiring is not critical. My Elmac and power supply set in an open framework which straddles the hump on the front floorboard. This method provides easy accessibility and quick removal. ■

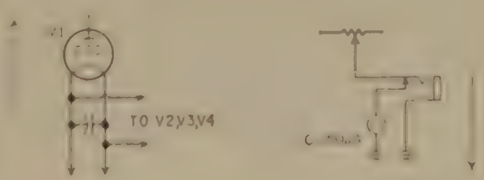
Bottom view of the power supply showing the coaxial antenna relay and a little of the control cable.

Parts List

T1—Stancor Transformer P-3064 6.3 volts, 8 amperes
C1—Aerovox AFH-1-24
C2—Aerovox AFH-2-57
Selenium rectifiers Federal 1028 - 250 ma or 1130 - 400 ma
Choke—10 henry - 200 ma
Bleeder Resistors—25 k 25 watt
25 k 10 watt
Chassis—3 x 5 x 10 inch
Relay—15 ampere contacts

Oops We Goofed

Grounded Grid Kilowatt Sept. p. 38
Return one side of T2 to one side of T5
Return one side of T3 to the other side of T5
Rewire the filament of V1 as shown below.



Der Nipper Sept. p. 56
Don can have his complete call WØQFZ and also change the 0-50 milliameter to 0-50 microamperes in fig. 2, p. 57 and move it to the contact shown above.

Grounded Grid Carbon Microphones Sept. p. 30
These amplifiers don't need coils (Honest Injun) please ignore the coil table till we find out where they belong.

MARS BULLETINS

Air Force Mars Eastern Technical Net

Sundays 2-4 PM EDT 3295 KC, 7540 KC, 15,715 KC

Nov. 16—Facts About Quartz Crystals. Mr. Roger A. Sykes and Panel, Bell Telephone Laboratories.

Nov. 23—Double Side Band With The DSB-100. Dr. John Costas, General Electric Company.

Nov. 30—More on Double Side Band and Synchronous Detection. Dr. John Costas and Mr. John Webb, General Electric Company.

Dec. 7—Let's Review Our Physics. Dr. Irving Mirman, Scientist, Rome Air Development Center & Chairman IRE Science Committee, Rome-Utica Section.

Army MARS

Wednesday Evenings 9 PM (New York Time EST) 4030 kc upper sideband.

Nov. 5—**"Application of Transistors in SSB Equipment"** by Tom Stewart, Engineering Manager, The Hallicrafters Co.

Nov. 12—**"Ionospheric Storms and Their Effect on Radio Communications"** by Luther C. Kelley, Project Engineer, U.S. Army Signal Radio Propagation Agency.

Nov. 19—**"The Engine Scope"** by Gene Ecklund, Manager Automotive Equipment Sales, A. B. DuMont Labs.

Nov. 26—**"Compatible Single Sideband"** by Leonard Kahn, President, Kahn Research Labs.

BASIC ELECTRONICS COURSE TO START ON MARS CHANNEL

On 5 November 1958, First US Army MARS in cooperation with the Fort Monmouth Signal Corps School will present a twenty-six hour course in "Basic Electronics." The lectures will be given each Wednesday evening from 8 to 9 PM (prevailing N.Y.C. time). The broadcast will be on AM on 4030 kc. Seven members of the Ft. Monmouth Signal Corps School Instructor Staff will do the teaching. Fred Dickson, AA2HJU and Lt. Colonel H. M. Russell, AA2ABH, will co-ordinate the course. Requests for additional information should be sent to MARS Director, First Army, Governors Island, New York 4, N.Y.

Mr. J. Harvey McCoy, W2IYX receive a D-104 microphone with a special honorary award name plate attached in recognition of his service as an Outstanding Radio Amateur from General Curtis E. LeMay. Mr. McCoy has been largely responsible for the excellent Air Force MARS Technical Series of broadcasts.

by FRANK ANZALONE, W1WY
14 Sherwood Road, Stamford, Conn.

CONTEST CALENDAR

October	25-26	CQ WW DX Phone
October	25-26	ARAC CW
November	1- 2	ARAC CW
November	8- 9	ARRL SS
November	15-16	ARRL SS
November	22-23	RSGB 21 28 Phone
November	29-30	CQ WW DX CW

CQ WW DX

About the time that most of us receive this issue, the Phone Section of the contest will be past history. We hope the Phone boys had a "ball."

There is still time for the CW gang to make last minute preparations. From the scuttlebut on the air and in the several DX Bulletins around the country, this one should be a real brawl. Look for some record-breaking Club Scores. Known activity from some rare spots during the contest can be expected from LX1KA and LX1RX, KB6BJ, VR2DG, DU7SV and VQ4CC to mention a few. Also look for some 160 meter activity between 0500 and 0800 GMT on each of the two nights. The loss of the 27 mc band to the U S boys should not make much difference in the scores. Those that can still use that band are free to do so in this year's contest.

A.R.A.C.

This is one for the certificate seekers. Too late to do much about the first week-end but you should be able to participate in the second week-end. (And one week-end should be enough anyway.)

1. Contest period: Saturday, 3:00 PM to Sunday, 7:00 PM EST, on both week-ends.
2. Work only CO7 stations. On CW and in the 20 and 40 meter bands only.
3. CO7 stations will send serial numbers consisting of your RST and the QSO number. Other stations will use the RST and their power as their serial number.
4. A diploma will be awarded to every station that works ten or more CO7 stations. The same station can be worked on two bands and credit will be given for two stations.
5. Send your logs before February 15, 1959, to the Amateur Radio Association of Camaguay, P.O. Box 28, Camaguay, Cuba.

ARRL SS

We were not officially notified about this one,

[*Continued on page 193*]

Continent winners of the EYMA 1957 Munich contest. Left to right, W3GHS, CN8ME, SM5LL, LU1EF and PY5DI (winner for Brazil). 4X4BX and ZL4CK, the other winners, were not present.

by BOB ADAMS, W3S

P.O. Box 625,
Silver Springs, Md.

sideband sideband sideband SIDEBAND

The past few months have been very productive ones for the DX minded SSB boys, with all of the DX-peditions and new countries appearing. Only a few months ago we were all dreaming of working one hundred countries and now it will not be too long in the future when some one will report two hundred worked. The following have worked over 140 countries on two way SSB: W4IYC, W2JXH, TI2HP, F7AF, VK3AEE, W8PQQ, W4INL, W6UOU, WØQVZ, W8GCN, W3SW, with most of them confirmed.

"Worked One Hundred" certificates have been awarded in the order of listing: W6UOU, W2JXH, F7AF, K6GMA, W3SW, W4IYC, TI2HP, W8QNF, W6ITH, VE3MR, W8GCN, W8EAP, W8YBZ, WØQVZ, WØFUH, W8PQQ, ZL3PJ, K2MGE, W2OQO, W2VZV, W6IAL, K2JFV, W1ADM, TI2RC, W2CFT, KØABH, ZL3IA and W6BAF. All twenty-eight of these stations have submitted 100 or more QSL cards from 100 countries indicating two-way SSB contacts.

Jack, HB9TL reports that he and HB9QR contacted 458 SSB stations on twenty while operating as HB1TL/FL in the Principality of Liechtenstein. A 75A4 receiver, with a 20A and 811A final was used with a trapped ground plane antenna during the three nights of operation. Jack writes that many stations who sent cards did not indicate that the QSO was two-way SSB, and he will send them "AM" cards in reply. He also is having difficulty checking his log to confirm the QSOs as many have used local time instead of GMT. Erwin and Jack hope to make the trip again next year.

One of the most coveted dx-peditions was VQ9GU on Seychelles. We are pleased to show photos of the station and the shack which Jimmy, VQ4GU used to put a real rare one o SSB. For the information of those who misse Jimmy we are sure it will be very good new to learn that he will return to Seychelles agai Robbie, VQ4ERR will also operate from VQ in the later part of next year. He will als operate from VQ1, Zanzibar in November.

Ted Henry's little transmitter turned up a Ceylon and caused many early morning pil ups on twenty with the call 4S7KD. The tran mitter is now on North Borneo from ZC5AI

Art, ZS6AQQ made a two-day stand at Fra cistown, Bechuanaland on August 30 and 3 operating as a portable ZS9. The transmitte was a 4-125A running at 50 watts with 20A and a tri-band Mosley antenna. Art wa accompanied by Ben, ZS6ARC who drove th 1100 miles by car over some pretty roug roads. QSL's should go to W4IYC with th

Joe Don

usual self addressed stamped envelopes.

Martin, VE3MR who has difficulty working into the far east, has 126 worked and 110 confirmed. He very kindly sent in the pictures of his dx-pedition to San Andres Island, HK0AI.

From Frank, W6IAL we have just learned that after a long battle with the government officials in Seoul, Korea, Tom, HL9KR has been forbidden to operate SSB any longer. He may operate CW or AM but is further restricted to the hours of 8.00 to midnight Korea time, and on only two frequencies, 14.180 plus or minus 5 Kc on Am and 14.030 CW. Tom hopes to have this ruling revised soon.

There are many dx-peditions scheduled for operation in some very remote places this Fall and Winter. In order to have the latest information on the times, dates and frequencies etc I recommend that you subscribe to Don Chesser's (W4KVX our DZ Editor) "Ohio Valley DX Bulletin." These Bulletins are published each Monday and the subscription rate of $6.00 includes first class mailing anywhere in the USA. An extra $1.50 provides for Air Mail. I have found Don's Bulletin invaluable in keeping up on all the latest DX, either SSB, AM or CW.

As this column is being written, our first WAS SSB Contest has just ended and from all indications it was very successful. Bill Leonard, W2SKE who proposed the contest said he had enjoyed every minute of it. Bill made 440 contacts in 47 States. He missed Nevada although it is definitely known that there were several SSB stations operating from that State. Several groups traveled to some of the less SSB populated States like New Hampshire, Vermont and Delaware and this sure helped to make the Contest more interesting. Ken, DL4CA just called in to say that he had participated in the Contest and had worked 43 states. He also said that Humberto, TI2HP was working stations like a machine when he last heard him. We hope

[*Continued on page 151*]

The DXpedition station HB1TL FL with Jack HB9TL and HB9QR in the background.

Shack of VQ9GU at Seychelles.

Station of VQ9GU with Jimmy, VQ4GU, at the mike.

Ernest—TI2EV

Bob, TI2RC operating, Humberto, TI2HP, logging and Martin, VE3MR QSLing.

RTTY

Byron H. Kretzman, W2JTP
16 Ridge Dr., High Hills,
Huntington Station, N. Y.

W2JTP at Keyboard of W6OWP in Belmont, California

Autostart is one of the most fascinatin
phases of RTTY operation. Most commonl
in use on 2 and on 6 meters with afsk, auto
start is an automatic control system that per
mits the reception of message traffic in th
absence of the station operator. Teletype ma
chines are weirdly started, type out message
and then shut down—without anyone ther
throwing a switch. (This can be very discon
certing to a ham's family!)

Briefly, there are two methods of autostar
in general use. In one, a time clock is em
ployed to turn on the vhf receiver and termin
unit (TU) at preset times, usually on the hou
of only certain hours. If, during the minut
or so that the equipment is on, a steady **mar**
tone is received, the printer motor starts u
and the machine is ready to copy. A stead
space tone of about one second will stop th
printer motor but will not shut down the re
ceiver and TU unless one minute goes b
without another steady mark tone being re

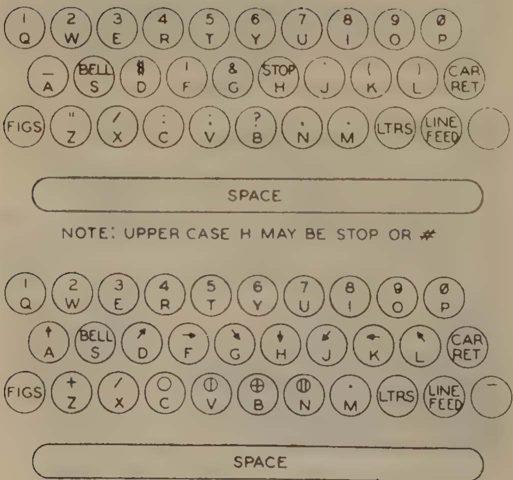


Fig. 1 Communications and Weather Keyboards

W6VVF, San Francisco, California. NCARTS, Inc., Member Station. The operator William E. (Nick) Nichols. Transmitters: BC-640-B for 2-meter afsk; T-350 for h-f fone-cw and fsk, 20-A with 4-400 amplifier for ssb, Communicator for 2-meters. Receivers: 51-J4 for fsk, Morrow mobile on 115-volts. Converter: CV-31-D/TRA-7 Dual Diversity. Antenna: Twin-Six. Machines: Model 26 page printer, Model 19 with perforator and TD, Model 14 typing reperforator.

ceived. (This permits several stations to be received, one right after the other.)

The other method requires that receiver and TU be left on continuously, with only the machine being controlled. This is a more simple method but the receiver and TU must be designed for continuous 24-hour a day operation. A slight disadvantage might be that machines can be started up, bells rung, etc., in the wee hours of the morning. (There are always comedians!)

Fail-Safe

Whichever method is used, the prime requirement is fail-safe reliability. Machines should start up on any RTTY signal strong enough to print good copy, yet they must *not* start up on any combination of QRN, QRM, or failure of any component. While ordinary hams might be reluctant to leave any of their equipment connected while they are not around, RTTYers should know enough to construct their gear with a generous safety factor and to fuse it intelligently.

Tune in next month and we will describe a much simplified autostart system that is equally applicable to the clock method or to the continuous monitoring method.

Weather

Figure 1 shows the communications keyboard arrangement of the usual *Teletype* machine as used by RTTYers. Also shown is the weather keyboard and type arrangement as used by government agencies in reporting the weather at airports all over the world. A surprising number of RTTYers, and SWL's, are pilots or do enough flying to be interested in this subject. If you have a general coverage receiver you probably have copied some of these stations, most of whom use 850 cycle shift.

If you are interested in further details on these weather broadcasts, we suggest that you refer to the RTTY columns in the October 1956 CQ and in the February 1957 CQ. Occasionally machines with weather symbols get into ham hands. Should you have one of these machines and would like to sell it, let's hear about it and we will mention it in your RTTY column. If you would like to find one yourself, let us know that, too. In the past, W9GRW has found a few machines with weather symbols, so try asking him, too.

[Continued on page 150]

by CHARLES J. SCHAUERS, W6QL[illegible]
CQ Magazine, 300 West 43rd St., New York 36, N. Y

ham clinic

Building your own ham equipment, whether it is merely a simple antenna tuner or a complicated bandswitching transmitter, is fun as well as educational. To those with a penchant for the slide-rule and reference tables, design is even more fun because of the anticipation involved.

Most hams however, are not designers and must depend strongly on construction information contained in articles such as those published in CQ, *RCA's Ham Tips*, *General Electric's Ham Bulletins* . . . QST and various radio handbooks. But we are inclined to think (by the number of letters received) that many amateurs are prone to expect *too much* detail in written form rather than resorting to a little "self-ingenuity."

The majority of questions relative to the construction of a piece of gear are those dealing with part substitution; questions which should have been directed to the authors of the various articles.

"Can I replace L-1 and L-2 in the circuit of the 'keedadleyhopper' on page 18 (of a book or magazine) with *National* coils," is a typical question.

Another: "how about replacing C-5 (.001 mfd.) with an .005 mfd. (that's all I have)? What will the effect be?"

Building a piece of equipment exactly as described in an article is the "safe" way to make certain that it has a fair chance of working. But then, one is still not sure because one may buy a ".005" mfd. condenser and it may actually be closer to .004 or .006 mfd. This small change can be tolerated in most ham circuitry, but if you're working with phasing circuits in SSB for example, you more tha[n] likely *will* have trouble.

Why most hams do not like the "cut an[d] try" method is beyond us, unless time is th[e] important factor.

No ham expects .0001% precision conden[-] sers and resistors in construction articles. How[-] ever, they do expect average parts to do th[e] job because most of them do not have ela[-] borate measuring equipment.

Most ham author-designers will tell yo[u] whether or not parts placement is critical and/ or if certain substitutions can be made of part[s] which control the parameters of certain critica[l] circuits. On the other hand, *basic* constructio[n] practices are taken for granted by most tech[-] nical authors.

Templates are nice and efficient but the ham who gets the greatest "kick" out of buildin[g] is the one who adapts what he has on hand and makes it "fit" mechanically as well a[s] electrically.

Few articles appear in which changes canno[t] be made—sometimes thereby boosting opera[-] tional efficiency as much as 50%. For exampl[e] I tried out the mobile converter designed b[y] W5ZCC described in the August '58 issue o[f] QST. I found that by substituting a *Tungs[ol]* 12EZ6 for the 12AF6 rf amplifier and [a] 12FA6 for the 12AD6 converter, and adding [a] 20mfd. filter between 12V– and 12V+, th[e] little set worked much better. Incidentally, [it] works ok on 40 meters too with proper co[il] substitutions.

Because of part value differences, no autho[r] can *guarantee* that his particular design wi[ll] always work, even if "copied to a T" by anyo[ne]

else. Now you can see the wisdom of our editor's disclaimer under the magazine's masthead!

Here's the *effective* way I have found to build a piece of equipment described in an article: first, study the text and circuits thoroughly to determine if it (the equipment) meets your requirements; second, look over the parts list and make a mental note of what you have on hand (still better, obtain a box and begin your parts collection); third, go to your parts house and obtain the balance of what you need (I never like to start construction until I have all parts); Fourth, measure, drill and fit your chassis with tube sockets, transformers, coils, switches, variable condensers, etc.; fifth, wire filaments, grid and cathode, plate and power circuits (I check off each connection made on the diagram with a black pencil); Sixth, recheck your connections and use a red pencil on the diagram—(merely write over the "Xs" already made); seventh, check operating instructions and adjustments and "fire her up." Simple? Not quite! Then comes (perhaps) hours of finding out why it won't work.

Observed

There are very few mobiles operating in Europe, what with gas costing a dollar or more a gallon, who besides those who drive motor scooters can afford to "call CQ" from a wheeled conveyance?

Questions

Because of the size of this issue of CQ, we're running short on space, so fewer questions this month.

Antenna Tuners

"Can you give me diagrams of an antenna tuner for (a) an end or center fed zepp; (b) a Marconi slightly shorter than an odd number of quarter wavelengths?"

Yes. See figures 1 and 2. (Coil and condenser combination to tune to band.)

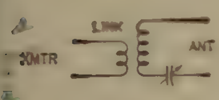


FIG. 1 ZEPP

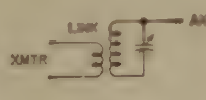


FIG. 2 MARCONI

UHF

"I want to build a small rf amplifier for 420 mc. What tube do you suggest and where can I find a diagram?"

See ARRL Handbook, current edition page 414 for an amplifier which uses a 6AJ4 tube.

Rectifier Replacement

"In replacing tube rectifiers with the new silicon types are there any special precautions to be taken?"

Yes. Although these rectifiers will operate from a –65° to 150 C. they still must be *well* ventilated and should *never* be mounted on or near high heat producing units, such as transformers, power tubes, etc. Make sure that the units you buy are capable of handling the voltage and current encountered. Above all make *certain* that you observe *polarity*. The instruction sheets are very explicit and if you follow them you can't go wrong.

Tech Information

"What do I do if I do not receive a reply from a manufacturer relative to a piece of his equipment? Surely, a buyer has the right to expect an answer, or doesn't he?"

A number of letters complaining that no replies were received to queries sent to some manufacturers (thank goodness, *no* CQ advertisers) have been sent to **Ham Clinic.** We have "re-queried" certain manufacturers with good results. However, it is suggested that readers who write for information *make certain* that their letters are properly addressed and above all, *courteous!* Although you may have a legitimate complaint, remember—no one has to answer any communication if it is full of abuse and with words not fit for print.

TI

"I live in an apartment house and everytime one of the tenants dials his telephone it raises heck with my receiver, what should I do?"

Call the telephone company. There can be many causes of the trouble. Inadequate grounds often contribute to or cause this trouble. Too, if your antenna is close to *open* (not cable) wire lines there will be induction.

Self Power

"I hear that a receiver has recently been made with transistors requiring no batteries, how is this possible?"

Special energy storage circuits. Rf radiation is received and then is rectified. Stored, it supplies the necessary voltages for operation of associated transistors. For a full article on this, see *Electronics*, page 63, May 9, 1958, Engineering Edition.

Thirty

Next month we'll discuss antenna *selection* and *why* some hams are fooled into believing that an antenna that works for one will work exactly the same for everyone else, regardless of location. Remember: limit your questions *one* to a letter and DO include a self-addressed stamped envelope for quick service.

73, Chuck W6QLV

SURPLUS

by KENNETH B. GRAYSON, W2HDM
110-20 71st Ave., Forest Hills 75, N. Y.

Not all surplus equipment is military in origin . . . although we generally consider it to be so. Quite a lot of commercial surplus is around in many forms, from the older types of diathermy machines (not FCC approved) to electric blanket controls. Somewhere in the middle of this maze is that piece of equipment once considered the ultimate. That it is no longer used is due to some development which caused our eyes to look to more modern equipment. Chances are that the old gear still works quite well and could easily be adapted to our present needs. I found just such a gem in the basement of W2UUD, and decided to show just how simple a conversion really can be . . . especially after the BC-603 last month.

The Ten-Eleven Meter Gonset converter was the heart of many a mobile installation of just ten years ago. It went the way of all flesh when the Tri-Band Converter was introduced, but it is still sensitive and reliable, and is sure to provide many more hours of good solid contacts. A lot has happened in just ten years. Single side-band came in, eleven-meters went out and six-meters is getting popular. We decided to put the old Ten-Eleven on Six. The job turned out to be really simple.

The first step is to open the unit. This is done by removing two nuts on the back and sliding cover off. Next remove the two knobs and the bushing nuts holding the front panel on. Slip the front panel off and carefully remove the plastic dial window. Chances are that the case is scratched or dented and needs some work. Trying to fix it with the paint on is a problem. We found it best to strip the paint off completely using a commercial paint solvent and then respray it later after we had cleaned up the cabinet.

The chassis is probably dusty, and some parts may need cleaning or replacing. Use a paint brush to clean the dust out and, if need be, check for those parts which may need a going over. Take off the dial card and make a new one from white cardboard or plastic, leaving room to calibrate the dial. You'll have to remove the pointer first, but this is held only by a screw so there is no problem.

You'll have to remove one plate of the rotor of the variable capacitor at the back end (oscillator end) of the set. This is done by removing the assembly screw at the center of the variable condenser shaft and taking one plate off. Reassemble, making sure all of the variable condenser plates are in line (as they were to begin with). The coils will need to have turns removed in order to reach the frequency we want to cover. The range we got was 50 to 53.5 mc which just misses being near the TV station interference. Remove turns from the *rf* and mixer coils so that there are 8 turns remaining, and then spread these turns to cover a length of about one and one-half inches. The oscillator coil is wound on a phenolic form and should have a total of seven turns. Remove turns from the top end of this coil until the seven turns remain. Make sure that the coil is now spread out to about one-half inch and make sure, too, that the tap is left at the two and a half turn location from the chassis end of this coil. The spreading of the coil should be done above the tap. Leave the insulated coils within the *rf* and mixer coils just as they were, and solder all connections, the coils and condensers as they were originally.

The next step is to align the converter. Put the dial we've made onto the chassis and mesh the condenser plates fully by turning the tuning knob shaft until the condenser is closed. Put the pointer on and set it so it points to the left. Using a grid dipper find the frequency to which the coils dip. The oscillator should be about 48.4 mc and the *rf* and mixer should be about 49.9 mc. If this is not so, adjust the trimmer condensers to get the dip. If you still can't get the coils to dip find out at what frequency they do dip at. If the frequency is lower you will have to spread the turns slightly until you get to the right frequency, and if it is higher you will have to squeeze the turns of the coils together slightly until they are on frequency.

Now, having gotten the low end to dip on frequency turn the condenser so it is fully open

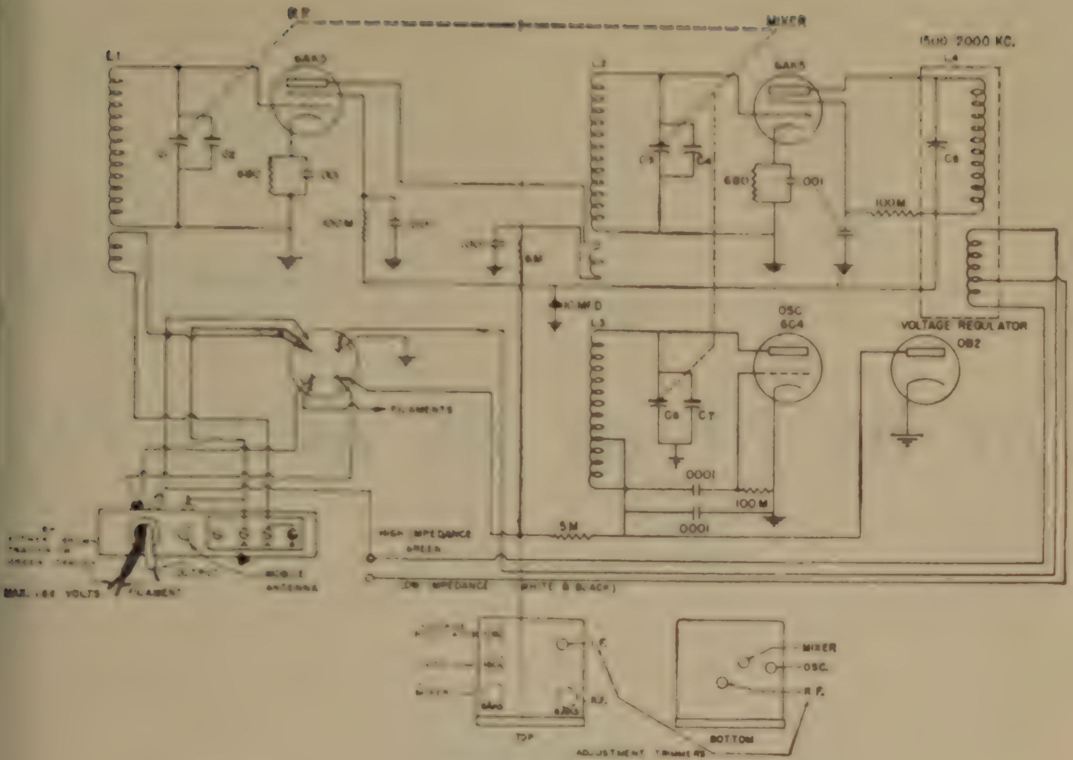


Fig. 1—Circuit of the Gonset 10-11 meter Fixed Mobile Converter.

The pointer should point to the right, and the coils should now dip at about 53.5 mc for the rf and mixer, and 52 mc for the oscillator. If this does not occur find out at what frequency the coils do dip at and if it is close (as it should be) adjust the trimmers slightly to bring it in. The rf and mixer coils should always be at the same frequency no matter where the dial is set, and the oscillator coil should always be tuned to 1.5 mc lower. By a little effort, we can adjust the coils and condenser to tune quite accurately over the band of 49.9 to 53.5 mc. A little bit of trimmer adjusting and then some coil adjusting will be all that should be necessary. No other circuit changes were necessary.

Calibration of the dial is simple. Although the grid dipper is accurate only for approximate adjustments final calibration should be done using known signals or a signal generator. The trouble with the signal generator is that the average one only goes to about 30 mc so we have to use the second harmonic of 25 mc for 50 mc (25.5 for 51 mc etc.). Mark the dial in pencil where the pointer should be for each frequency mark you want. Remove the dial and ink in the calibration, reassemble the dial and reset the pointer. Check the calibration again and if ok reassemble the unit in its case. Of course for calibration you will have to apply power and feed the output to a receiver. Don't try to use an AC-DC type receiver as it may cause you to get shocked, and it certainly cannot supply the 150 volts at 20 ma and 6.3v at one half ampere necessary to operate the converter.

The antenna terminal strip in the back was provided for a separate antenna should the installation use twin lead or single wire antenna. For the single wire antenna lead in one terminal A is grounded. For our use we can use the standard coaxial input and disregard this feature. When using a standard whip, the same antenna may be used for broadcast reception. No attempt was made to use a helix. Should any voltage above 180 volts be used (but not more than 300VDC) a 5000 ohm ten-watt resistor should be used in series with the B plus lead to limit current in the voltage regulator. Once installed, peak the output transformer with the receiver tuned to 1500 kc and the converter tuned to a station.

News

We get a lot of mail, as you might expect, from hams all over the world . . . hams with a common problem . . . conversion. We an-

[*Continued on page 154*]

by DON CHESSER, W4KVX
R.F.D. 1, Burlington, Ky

DX DX DX DX DX DX DX DX

CQ HONOR ROLL

(Awards issued August 15 to September 15, 1958)

WAZ CERTIFICATES ISSUED

#781	Antonio Navatta	LU5AQ
#782	H. O. Sills	G8QZ
#783	W. B. Hopkins	G3FPI
#784	J. Reisert	W2HQL
#785	Gerhard Blechert	DL9TJ
#786	D. S. Dirden	K6EDE
#787	Charles L. Burgoyne	W1LHZ
#788	Loren F. Ashwood	W9PQA
#789	Don C. Palmer	WØSNL
#790	Joseph A. Anderten	W2GNQ
#791	Elmer H. Burgman	W6CTO
#792	Pentti Ahola	OH5NJ
#793	Martti H. Rautio	OH3RA
#794	Ady Lumpert	HB9UL
#795	Rudolf Timmermans	PAØRLF
#796	Emil Hlom	OK1AEH
#797	Blanche G. Edwards	W9QLH
#798	Hal Roberts	K6CWS
#799	J. R. Keys	ZL3GU
#800	H. D. Sandford	ZL2AI
#801	Lauren L. McMaster	K2QNG
#802	Everett A. Erickson	W1NLM
#803	Jose Nativilae Silva	PY1HX
#804	Mel Wardell	K4LPW
#805	Dick Feeling	W5TIZ
#806	William J. Nolan	W9TQL
#807	A. F. Kuschner	W4CRP
#808	Kenneth F. Gillum	W1QJR
#809	Robert John Boal	GI3AXI
#810	Bruce F. Barnard	ZL1AJU
#811	D. E. C. Lockyer	G3HCL
#812	Jack Coldwell	W4VYP
#813	Cristo Foro Crespi	I1SM
#814	Wm. H. Barber	VK6DX

ALL PHONE WAZ

#20	Cristo Foro Crespi	I1SM

CW WPX

#13	Charles G. Price	W4GXB

If you have recently received an FCC citation for "tail ending" (signing only your call at the end of another's transmission) you are in good company. Quite a number of prominent DXers have found these slips in their mail boxes for violations during DXpedition pile-ups in recent months, most of them originating at monitoring stations in Michigan and Georgia. The rule violated, of course, is that requiring transmissions be complete with call letters of the station called as well as those of the calling station.

It is difficult to understand the FCC's purpose in enforcing this minor rule, when its enforcement serves no good purpose and only results in chaotic conditions for us. Nearly all of us are guilty of "tail ending", for it has proved to be superb operating practice, result ing in the very minimum of QRM and con fusion during contests and DX pile-ups. Sinc the system is used mostly during those opera tions when many are calling the same station there should be little doubt in anyone's mind a to who's calling whom.

This apparently puts a stop to the "DE system of DX operating instigated by Rec W8EZF, at VP5BH, and later continued wit extraordinarily good results at KC4AF. It' the only system we've ever heard that controlle pile-ups, for it permitted us to work so fas they just couldn't develop.

A representative of the FCC, cornered a the Washington National Convention las August, said he knew of no concerted prograr

by the FCC against this minor infraction of the rules. But rules are rules, he pointed out, and "tail ending" is an infraction.

Speaking of the Washington National Convention, the contest and DX sessions MC'd by W3EIS and W4 KFC respectively, were judged to be unqualified successes. These two hard pressed, nerve wracked individuals turned in flawless performances, although conditions behind the scenes were less than perfect. The movie projector, for example, for presenting the KC4AF 16mm DXpedition film, turned out to be the wrong type. Vic, W4KFC, oozed quantities of nervous perspiration in his efforts to rearrange the DX session in progress, feature by feature, while the city was canvassed for a proper projector. One was found just in time for that part of the program, but then it developed Wayne, W2NSD, scheduled to narrate the film, was in another part of the hotel speaking on the delightful subject, "Sex and Amateur Radio"!

It all ended well, however. Vic handled the situation so smoothly it is doubtful the audience was more than slightly aware that the program had been changed around a bit.

Although it would appear the huge, sprawling Sheraton-Park Hotel, site of this year's convention, should have an ample supply of rooms for conventioneers, considerable difficulties were experienced by many, especially at the reservations desk. One such problem was related by Bill Leonard, W2SKE, HH2SKE, etc. While driving down from New York, Bill endeavored to confirm his hotel reservation via ham radio with the aid of his mobile rig. Skip conditions made it necessary for him to relay the confirmation message via a W6 in California to a W3 in Washington, who phoned the hotel. Receipt of the message was dutifully acknowledged back to Bill, who confidently strode up to the reservations desk on his arrival. "Oh yes," remarked the clerk, "this is the reservation that was cancelled by that strange message from California a little while ago."

The highlight of the convention for many DXers occurred at the DX luncheon when W2SKE narrated an epic poem relating the ultimate in DXpeditions—an earth satellite manned by an ardent DXer who became 280 countries in the first few hours of orbit! This poem, a tension builder with a roaring climax, is a masterpiece, but much credit for its tension builder with a roaring climax, is a masterpiece, but much credit for its dramatic presentation goes to W2SKE, who proved his ability as a radio and TV star, presently narrator of the Voice of America world-wide amateur radio programs. If you get a chance to hear this poem, especially as presented by Bill, don't miss it! It, alone, is worth the price of admission.

WPX BOX SCORES

CW			
W2HMJ	451	W6RLP	276
OK1MB	380	W8IBX	255
W5KC	359	W1FIO	243
W6KG	353	WØBCI	242
W9II	344	VK4YP	238
W5AFX	312	K2PFC	231
SM5AHK	311	K6SXA	200
W9BPW	310	W4KVX	172
W1BFT	304	W8CSK	170
W2DGW	301	W4KAE	140
LU5AQ	301	Phone	
W8KPL	300	W8WT	340
W4GXB	300	G3DO	315
SM5CCE	299		
W8LY	294	SSB	
DL1QT	289	TI2HP	155

DX NEWS

(All times noted are GMT)

Further DXpedition rumblings in *Zone* #7 lead off the DX roundup this month with a full-scale assault on Galapagos Islands by Ron, WØAGO, who will sign HC8AGO; Paul WØLUX, HC8LUX; and Vic, WØWGF, HC8WGF; for two to four weeks starting the end of September. Planned and in negotiation for licenses, transportation, customs clearance, etc., for nearly a year, in co-operation with the Quito Radio Club of Ecuador, this ambitious DXpedition hopes to pick up two or four additional operators from the Quito club. Beautifully equipped to operate 10, 15, and 20 meters CW, AM, and SSB, the latter will probably be the mode of transmission favored. Daily skeds will be kept with Quito on 40 meters, although general operation is not planned for this band.

The expedition, called Operation Turtle, will be accompanied by two doctors, one from the University of Michigan and the other from New York University, who will make a survey of the islands for the purpose of locating a clinic there for the treatment of arthritis. The Galapagos Islands' climate is said to be the most perfect in the world. The expedition name, incidentally, is derived from the multitudes of turtles, many of them weighing as much as 500 pounds, which live on the islands.

Still another DXpedition in the zone #7 area, that of Ralph Ladd, W3KA, to Swan Island as KS4AZ, for the period September 26 to October 4, promises activity in a country that has become somewhat rare in recent years. QSL's go to the home QTH of W3KA. Doug, operator of FO8AT, Clipperton Island, is reported to have stopped off in Mexico City on his return to San Diego to inquire into possibilities of an XE4, Socorro Island, license and landing permission for the San Diego DX Club this fall or winter. At this writing we haven't learned the results of his inquiry. Other zone #7 activities: TI2WR, 14010 kc CW, 0300-GMT; TG7AB, 21115 kc CW, 0200; YS1MS, 14320 kc SSB, 0300; YS1O, 14085 kc CW, 1930.

There is presently only one station, VP2SH, on St. Vincent, *Zone* #8, and he operates 7 mc

only, reports W5HJA. He meets a net every Tuesday on 7245 kc (time not known), the net control station of which is KP4USA. Danny Weil, currently at VP2AY, Antigua, plans Dominica, VP2D-, next, probably about the first of October. Reg, W6ITH, is now back at PJ2MC, with no further developments reported in the Anguilla small-pox situation. VP5CB, first SSB station on Grand Turks, will work as many stations as possible, but requests we not break in on their personal QSO's or phone patches. This station is the only Stateside contact for Navy Seabee personnel stationed on the island. Other zone #8 notables: VP2GL, 14025 kc CW, 1045; FG7XC, 14037 kc CW, 1100; VP2AB, 21210 kc AM, 2300; VP2GV, 21223 kc AM, 2100; FG7XF, 14043 kc CW, 0100; VP2AZ, 14309 kc SSB, 0130.

The Trinidad Island, *Zone #11*, DXpedition by PY1CK (as PYØNA), PY2CK (PYØNB), PY7AN (PYØNC), PY1HQ (PYØND), and PY1BIG (PYØNF), is still on for late October or early November, the exact dates not yet known, writes George, W8BKP, after a long chat with Flavio, PY1CK. After that PY1CK and PY1BIG will go to Fernando de Noronha again for one week to complete Flavio's DXCC from that island. He worked 85 countries from there during his first trip. Flavio is currently engaged in writing QSL's for his previous Trinidad trip, but he finds the chore slow going. He's mailing about 50 a week, with about 600 to go! He asks for patience from the expectant DXers. Fernando de Noronha is currently active in the person of PY7AFN, permanently stationed on that island with PY7SC. Don't let the PY7 prefixes fool you. PY1AQT [*Continued on page 163*]

ADDRESS

AP2M—Razak Tenjani, P O Box 4074, Karachi-2, Pakistan
BV1USB—Area 4, APO #63, San Francisco, California
CE1DC—Dario Perez Garry, Casilla 255, Copiapo, Chile
CEØAG—W. E. Douglas, K6BAZ, 8913 Broadway, San Gabriel, California
CN8FW—B. P. 412, Oujda, French Morocco
CP1AM—Mac, c/o U S Embassy, La Paz, Bolivia
CT2AI—Box 29, Ponta Delgada, Azores Island
DU9JO—Justino E. Ongchua, Cotabato, Mindanao, Philippine I.
EA8BC—P O Box 8, Laguna, Canary Islands
EA8CP—Box 215, Santa Cruz de Tenerife, Canary Island
EA9AP—Box 213, Melilla, Spanish Morocco
EL1X—Box 18, Harbel, Liberia
FB8BS—Andre, Box 1619, Tanarive, Madagascar
FO8AD—Joe Bourne, Ave du Commandant Chesse, Papeete, Tahiti
FO8AK—George Henderson, Avenue du Cdt. Chesse, Papeete, Tahiti
FM7MU (ex-FY7YH)—W/K/VE's QSL via W9YSX, Skip Frankie, RFD 6, Box 92, Greenfield, Ind., Direct QTH: Box 61, Fort de France, Martinique
FP8AR—Via Ed Benkis, W2HTI, Box 385, Halsey Rd., Parsippany, N. J.
FP8BC—QSL via W2BWQ, Edwin Iriye, 110-14 62nd Dr., Forest Hills 75, N. Y.
FQ8AJ—Gilbert, P O Box 2023, Brazzaville, Moyen Congo, French Equatorial Africa
FU8AG—Vincent Vidal, Box 44, Port Vila, New Hebrides
HA5BI—S; Istvan Biro, Szt. Istvan U. 182, Budapest XXI, Hungary
HA5DH—S; Oscar Kalmar, Metro U. 18, Budapest XVI, Hungary
HI8GA—44 Doctor Delgado Street, Ciudad Trujillo, Dominican Republic
HL9KR—QSL via W6IAL
HL9KS—SP/2 Wm. Shipp, HQ KMAG, APO 102, San Francisco, California
HP1ME—Manuel, P O Box 493, Panama, Republic of Panama
HRØAA—QSL via W3YZS, Carl Moore, 112 Palm Ave Warren, Pa.
IT1ZND—Stella Polare, 44 Catania, Sicily, Italy
IS1AUI—Paolo, Via Umbria 15, Cagliari, Sardinia
JZØDA—Sentani Air Strip, Netherlands New Guinea
JZØHA—Box 420, Sorong, Netherlands New Guinea
ex-KA2KS—214 Thelma Drive, San Antonio, Texas
KA7HH—QSL via John A Moran Jr., W1AHQ, 4 Hillside Ave, Malden, Mass.
KA9AF—Capt. A. D. Frink, APO #70, San Francisco California
KAØIJ—Ted, APO 19, San Francisco, California
KAØIK—APO 815, c/o PM, San Francisco, California
KC4USK—For QSO's with opr Don, QSL to Don Edman c/o Post Office, Solomons, Md.
W2EPS/KJ6—c/o U S Coast Guard Loran Station, APO 105, San Francisco, California
KL7FLA—Phil, 4143 Edgewater Dr., Orlando, Florida
KL7OOT—Box 487, Fairbanks, Alaska
KP6AN—QSL via W6SGP, George W. Richert, RFD 4 Box 464A, Turlock, Calif.
Okinawa Amateur Radio Club, APO 331, San Francisco California
LU3ZJ—Pola 1354, Buenos Aires, Argentina (His card will be sent when he returns to Buenos Aires end of this year)
LZ1AF—Dimiter Petrov, Box 412, Sofia, Bulgaria
OA4GB—William Dubbs, Apartado 4407, Lima, Peru
OA4IGY—Minitrack Tracking Station, c/o U S Embassy Lima, Peru
OK3AL—Ing. Svejna, Brezno, Slovakia, Czechoslovakia
OX3WD—Willy Nielsen, Julianehab, Greenland
OY1J—J. Gerlalid, Klakksvig, Faeroe Islands
OY1L—Robert a Lakjuni, a, Gordum Klakksvig, Faeroe Islands
OY1X—Elias Hansen, Selheyg, Klakksvig, Faeroe Island
PY4ZG—Dijalma Nunes Grandi, Rua Tres Ponta, 263 Belo Horizonte, Brazil
SU1IM—QSL via G. Cole, W9DRS, Homestead 30 Decatur, Ill. (Please include stamped return envelope with your card)
SVØWA—American Consulate General, APO 223, New York, N. Y.
TF2WDA—932 AC & W, Box 60, APO 81, New York N. Y.
TI2CME—P O Box 2529, San Jose, Costa Rica
TI2WD—Roy, Box 2412, San Jose, Costa Rica
VE8MC—Jt. Canadian/US Arctic Weather Station, Mould Bay, N. W. T., Canada
VK4AL—Everett Brown, c/o Clontarf Beach Post Office Queensland, Australia
VK9BS—c/o P O Box 84, Port Moresby, Territory Papua
VKØKT—QSL via VK2EG
VP1FL—Box 377, Belize, British Honduras
VP2AB—QSL to Box 39, Antigua, B. W. I. (not via bureau)
VP2GL—Art, Box 44, St. Georges, Grenada, B. W. I.
VP2GV—Grandon Hall, St. Andrews, Grenada, West Indies Federation
VP2KF—QSL to KV4AA
VP2LS—Lionel Ellis, P O Box 171, Castries, St. Lucia B. W. I.
VP2MR—P O Box 221, Plymouth, Montserrat
VP5CB—MCB-7, FPO, New York, N. Y.
VP8CE—Peter Catlow, FIDS, Base J, Fenn Head, via Port Stanley, Falkland Islands
VP8CY—QSL via G8FC
VP8DS—Les Hardy, Port Stanley, Falkland Islands
VP8DW—Tony Hardy, Port Stanley, Falkland Islands
VQ3CF—QSL via W2CTN, Jack Cummings, 159 Ketchan Ave., Amityville, N. Y., (include stamped return envelope)
VQ5FS—T. P. Tierney, P O Box 118, Jinia, Uganda
VR2DE—Dennis, P O Box 225, Nanda Airport, Fiji Island
VS1FJ—F/Sgt Frank Johnstone, RAF Changi, Singapore 17
VS9AS—QSL via RSGB
VS9MA—QSL via RSGB
VU2JG—Jalesh C. Ganguli, F148 South Vinay Nagar, New Delhi, India
WL7CON—Box 487, Fairbanks, Alaska
XE1ZM—E. J. Rudisuhle, Apdo Postal 26010, Mexico 1 D. F. Mexico
XW8AI—Box 115, Vientiane, Laos
YN1JW—Juan, P O Box 389, Managua, Nicaragua
ZC4RF—c/o RAF, BFPO 53, Nicosia, Cyprus
ZD7SZ—QSL via W9FJY, RFD #2, Mascoutah, Ill.
ZD9AF—QSL via SARL, Capetown, Union of South Africa
ZK1AK—Norm Walding, c/o CAA, Aitutaki, Cook Islan
ZK2AD—Les Hack, Radio Station, Niue Island, V New Zealand

[*Continued on page 163*]

Distributor Index

One problem that faces the amateur when he reads about something that interests him is, "Where Do I Get It?" This can be pretty frustrating at times. The handy list on the following pages will tell you where you can buy what you want. We suggest you stick a book mark in this section so you can pull it off the shelf and use it for reference all year 'round.

ALPHABETICAL LIST OF DISTRIBUTORS

Ack Radio Supply Company 42
3101 Fourth Avenue, So.
Birmingham 5, Ala.

Ack Radio Supply Company of Georgia 43
331 Luckie Street, N. W.
Atlanta 13, Georgia

Adirondack Radio Supply 36
185-191 West Main Street
Amsterdam, New York

Alco Electronics 50
3 Wolcott Avenue
Lawrence, Mass.

Alltronics-Howard Co. 89
278 Friend Street
Boston, Massachusetts

Alltronics-Howard Co. with Shumaker & Evans 90
60 Spring Street
Newport, Rhode Island

Almo Radio Company 75
1122 French Street
Wilmington, Del.

Almo Radio Company 76
317 Park Heights Ave.
Salisbury, Md.

Almo Radio Company 74
4401 Ventnor Avenue
Atlantic City, N. J.

Almo Radio Company 73
1133 Haddon Avenue
Camden, New Jersey

Almo Radio Company 77
201 Calhoun Street
Trenton, New Jersey

Almo Radio Company 78
550 Markely Street
Norristown, Pa.

Almo Radio Company 70
913 Arch Street
Philadelphia 7, Pa.

Almo Radio Company 71
7540 Frankford Avenue
Philadelphia, Pa.

Almo Radio Company 72
6205 Market Street
Philadelphia, Pa.

Amateur Electronic Supply 52
3832 West Lisbon
Milwaukee, Wisconsin

Antrim Marine Radio 65
4022 Woodruff Road
Lafayette Hill, Pa.

Arrow Electronics Inc. 69
525 Jericho Tpke.
Mineola, L. I., N. Y.

Arrow Electronics Inc. 68
65 Cortlandt Street
New York 7, New York

Barry Electronics Corp. 98
512 Broadway
New York 12, New York

Bond Electronics Inc. 32
42 Cornhill
Boston 8, Mass

Lew Bonn Company 91
67 South 12th Street
Minneapolis 3, Minn.

Burghardt Radio Supply 49
Box 746
Watertown, South Dakota

Burstein-Applebee Company 80
1012-14 McGee Street
Kansas City 6, Missouri

C & G Radio Supply Co. 92
2502-6 Jefferson Avenue
Tacoma, Washington

James W. Clary Company 33
1713 Second Avenue, South
Birmingham, Alabama

Crabtree's Wholesale Electronics 64
2608 Ross Avenue
Dallas 1, Texas

Cramer Electronics Inc. 31
811 Boylston Street
Boston 16, Mass.

Crawford Radio 27
119-121 John Street, N.
Hamilton, Ont., Canada

Custom Electronics, Inc. 1
1918 S. Brown Street
Dayton 9, Ohio

Dalton-Hege Radio Supply Co., Inc. 35
912 West Fourth Street (rear)
Winston-Salem, N. C.

Dow Radio, Inc. 29
1759 E. Colorado St.
Pasadena, California

W. H. Edwards Co., Inc. 30
94 Broadway
Providence 3, Rhode Island

Elmar Electronics 63
140 11th Street
Oakland 7, California

Electronics Equipment Distributor 8
3686 El Cajon Blvd.
San Diego 4, California

Electronics-Suppliers 6
2428 Shattuck Avenue
Berkeley, California

Electronic Supply 62
909 Morningside Drive
Melbourne, Florida

Electronic Supply 61
61 N. E. 9th Street
Miami 32, Florida

Evans Radio Inc. 94
Rt. 3A Bow Jct.
Concord, New Hampshire

Fargo Radio Service Company 54
513 3rd Avenue, North
Fargo, North Dakota

Gopher Electronics Co. 28
370 Minnesota Street
St. Paul, Minnesota

Grice Electronics, Inc. 83
300 East Wright St.
Pensacola, Florida

H & H Electronic Supply, Inc. 26
506-510 Kishwaukee Street
Rockford, Illinois

Hagerty Radio Supply 16
2926 W. Magnolia
Burbank, California

Ham 'N Hi-Fi 22
826 N. Main Street
Dayton 5, Ohio

Harris Radio Corporation 51
289 N. Main Street
Fond du Lac, Wisconsin

HARRISON "Ham Headquarters, USA" 23
225 Greenwich Street
New York 7, New York

HARRISON "Ham Headquarters, USA" 24
144-24 Hillside Avenue
Jamaica, Long Island, N. Y.

Henry Radio 10
11240 West Olympic Blvd.
Los Angeles 64, California

Henry Radio 11
Butler, Mo.

Ken-Els Radio Supply Co. 5
428 Central Avenue
Fort Dodge, Iowa

Kierulff Electronics Inc. 88
820 W. Olympic Blvd.
Los Angeles 15, Calif.

Klaus Radio & Electric Co. 38
403 East Lake Street
Peoria, Illinois

Harold Lund, W8LIM 53 (Field Rep.)
532 East Birch Street
Ironwood, Michigan

Larry Lynde Electronics W6UG-W6DEP 60
1526 East 4th Street
Long Beach 12, California

The Mytronic Company 47
2145 Florence Avenue
Cincinnati 6, Ohio

Nidisco-Cliff, Inc. 56
484 Bergen Blvd.
Ridgefield, New Jersey

Nidisco-Hack, Inc. 57
55 State Street
Hackensack, New Jersey

Nidisco Jersey City, Inc. 55
713 Newark Avenue
Jersey City, New Jersey

Nidisco-Pass, Inc. 58
294 Passaic Street
Passaic, New Jersey

Nidisco-Trenton, Inc. 59
985 Princeton Avenue
Trenton, New Jersey

Payette Radio Limited 14
730 St-James St., West
Montreal 3, P. Que.

Pioneer Electronic Supply Co. 2
Amateur Department
2103 East 21st Street
Cleveland 15, Ohio

Portland Radio Supply 39
1234 S. W. Stark
Portland 5, Oregon

Radio Distributing Company, Inc. 15
1212 High Street
South Bend 24, Indiana

Radio Electric Service Co. of N. J., Inc. 12
513 Cooper Street
Camden 2, New Jersey

Radio Electric Service Co. 13
452 N. Albany Avenue
Atlantic City, New Jersey

Radio Electric Service Company 40
5 N. Howard Street
Baltimore 1, Maryland

Radio Electric Service Company 41
7502 Eastern Avenue
Baltimore 24, Maryland

Radio Parts of Arizona 87
P. O. Box 6345
214 South 11th Avenue
Phoenix, Arizona

Radio Parts of Calexico 9
116 2nd Avenue
Calexico, California

Radio Products Sales Co. 18
1237 16th Street
Denver 2, Colorado

Radio Shack Corporation 46
230-240 Crown Street
New Haven, Connecticut

Radio Shack Corporation 44
730 Commonwealth Avenue
Boston, Massachusetts

Radio Shack Corporation 45
167 Washington Street
Boston, Massachusetts

Radio Trade Supply Co. 7
1224 Grand Avenue
Des Moines 9, Iowa

Rogers Radio Company 48
1648-52 Wazee Street
Denver, Colorado

Satterfield Electronics Inc. 37
1900 South Park Street
Madison, Wisconsin

Selectronic Supplies Inc. 82
803 So. Adams
Peoria, Illinois

Selectronic Supplies Inc. 81
3185 Bellevue Rd.
Toledo, Ohio

Bill Thompson Radio Supply 67
11159-61 Washington Blvd.
Culver City, California

United Radio Supply, Inc 19
22 N. W. Ninth Avenue
Portland 9, Oregon

United Radio Supply, Inc. 20
697 South 12th Street
Salem, Oregon

United Radio Supply, Inc. 21
974 West Sixth Street
P. O. Box 3266
Eugene, Oregon

Valley Electronic Supply Co. 3
1302 W. Magnolia Blvd.
Burbank, California

Valley Electronic Supply Co. 4
17647 Sherman Way
Van Nuys, California

Valley Engineering Company 85
625 East Main
Farmington, New Mexico

Valley Engineering Company 84
601 Cedar Street
Los Alamos, New Mexico

Valley Engineering Company 86
241 West Alameda
Santa Fe, New Mexico

Valley Radio Distributors 34
518 N. Appleton Street
Appleton, Wisconsin

Variety Electronics Corp. 79
Bloomfield Ave. at State St.
Bloomfield, New Jersey

Verl G. Walker Company 17
P. O. Box 1586
205 West Jackson
Medford, Oregon

Eugene G. Wile 25
218-220 South 11th Street
Philadelphia 7, Penna.

World Radio Labs Inc. 66
3415 West Broadway
Council Bluffs, Iowa

NUMERICAL LIST OF DISTRIBUTORS

1 [illegible]

2 [illegible]

3 [illegible]

4 [illegible]

5 [illegible]

6 [illegible]

7 [illegible]

8 [illegible]

9 [illegible]

10 [illegible]

11 [illegible]

12 Radio [illegible] Co. of N. J., Inc. [illegible] Street [illegible] 2, New Jersey

13 Radio Electric Service Co. [illegible] N. Albany Avenue Atlantic City, New Jersey

14 [illegible] Montreal [illegible] P. Que.

15 Radio [illegible] Indiana

16 [illegible] Radio Supply [illegible] Burbank, California

17 Verl G. Walker Company P. O. Box 1586 [illegible] West Jackson Medford, Oregon

18 Radio Products Sales Co. [illegible] 16th Street Denver 2, Colorado

19 United Radio Supply Inc. [illegible]

20 United Radio Supply Inc. [illegible] South 12th Street [illegible]

21 United Radio Supply Inc. [illegible] West Sixth Street P. O. Box [illegible] [illegible]

22 [illegible]

23 HARRISON "Ham [illegible] U.S.A. [illegible] New York 7, New York

24 HARRISON "Ham Headquarters, U.S.A." 144-24 Hillside Avenue [illegible] Island, N. Y.

25 [illegible]

26 [illegible]

27 [illegible]

28 [illegible]

29 [illegible]

30 [illegible]

31 [illegible]

32 [illegible]

33 James W. Clary Company [illegible] Avenue, South Birmingham, Alabama

34 Valley Radio Distributors 518 N. Appleton Street Appleton, Wisconsin

35 Dalton-Hege Radio Supply Co., Inc. 912 West Fourth Street (rear) Winston-Salem, N. C.

36 Adirondack Radio Supply 185-191 West Main Street Amsterdam, New York

37 Satterfield Electronics Inc. 1900 South Park Street Madison, Wisconsin

38 [illegible]

39 Portland Radio Supply 1234 S. W. Stark Portland 5, Oregon

40 Radio Electric Service Co. 5 N. Howard Street Baltimore 1, Maryland

41 Radio Electric Service Co. 7502 Eastern Avenue Baltimore 24, Maryland

42 Ack Radio Supply Company 3101 Fourth Avenue, So. Birmingham 5, Ala.

43 Ack Radio Supply Company of Georgia [illegible] Luckie Street, N. W. Atlanta 13, Georgia

44 Radio Shack Corporation 730 Commonwealth Avenue Boston, Massachusetts

45 Radio Shack Corporation 167 Washington Street Boston, Massachusetts

46 Radio Shack Corporation [illegible] Crown Street New Haven, Connecticut

47 The Mytronic Company 2145 Florence Avenue [illegible] Ohio

48 Rogers Radio Company 1648-52 Wazee Street Denver, Colorado

49 Burghardt Radio Supply Box 746 Watertown, South Dakota

50 Alco Electronics 3 Wolcott Avenue Lawrence, Mass.

51 Harris Radio Corporation 289 N. Main Street Fond du Lac, Wisconsin

52 Amateur Electronic Supply 3832 West Lisbon Milwaukee, Wisconsin

53 Harold Lund, W8LIM (Field Rep.) 532 East Birch Street Ironwood, Michigan

54 Fargo Radio Service Company [illegible] Avenue North Fargo, North Dakota

55 Nidisco Jersey City, Inc. 713 Newark Avenue Jersey City, New Jersey

56 Nidisco Cliff. Inc. 184 Bergen Blvd. [illegible], New Jersey

57 Nidisco Hack. Inc. [illegible] Street Hackensack, New Jersey

58 Nidisco Pass. Inc. 201 Passaic Street Passaic, New Jersey

59 [illegible] Trenton, New Jersey

60 Larry Lynde Electronics W6UG W6DEP 1726 East 4th Street Long Beach 12, California

61 [illegible]

62 [illegible] Melbourne, Florida

63 Elmar Electronics 140 11th Street Oakland 7, California

64 Crabtree's Wholesale Electronics [illegible] Ross Avenue Dallas 1, Texas

65 Antrim Marine Radio 4022 Woodruff Road Lafayette Hill, Pa.

66 World Radio Labs Inc. 3415 West Broadway Council Bluffs, Iowa

67 Bill Thompson Radio Supply 11159-61 Washington Blvd. Culver City, California

68 Arrow Electronics Inc. 65 Cortlandt Street New York 7, New York

69 Arrow Electronics Inc. 525 Jericho Tpke. Mineola, L. I., N. Y.

70 Almo Radio Company 913 Arch Street Philadelphia 7, Pa.

71 Almo Radio Company 7540 Frankford Avenue Philadelphia, Pa.

72 Almo Radio Company 5205 Market Street Philadelphia, Pa.

73 Almo Radio Company 1133 Haddon Avenue Camden, New Jersey

74 Almo Radio Company 4401 Ventnor Avenue Atlantic City, N. J.

75 Almo Radio Company [illegible] Street Wilmington, Del.

76 Almo Radio Company 317 Park Heights Ave. Salisbury, Md.

77 Almo Radio Company 201 Calhoun Street Trenton, New Jersey

78 Almo Radio Company 750 Markley Street Norristown, Pa.

79 Variety Electronics Corp. Bloomfield Ave. at State St. Bloomfield, New Jersey

80 Burstein-Applebee Company 1012-14 McGee Street Kansas City 6, Missouri

81 Selectronic Supplies Inc. 3185 Bellevue Rd. Toledo, Ohio

82 Selectronic Supplies Inc. 803 So. Adams Peoria, Illinois

83 Grice Electronics, Inc. 300 East Wright St. Pensacola, Florida

84 Valley Engineering Company 601 Cedar Street Los Alamos, New Mexico

85 Valley Engineering Company 625 East Main Farmington, New Mexico

86 Valley Engineering Company 241 West Alameda Santa Fe, New Mexico

87 Radio Parts of Arizona P. O. Box 6345 214 South 11th Avenue Phoenix, Arizona

88 Kierulff Electronics Inc. 820 W. Olympic Blvd. Los Angeles 15, Calif.

89 Alltronics-Howard Co. 278 Friend Street Boston, Massachusetts

90 Alltronics-Howard Co. with Shumaker & [illegible] 60 Spring Street Newport, Rhode Island

91 Lew Bonn Company 67 South 12th Street Minneapolis 3, Minn.

92 C & G Radio Supply Co. 2502-6 Jefferson Avenue Tacoma, Washington

93 Barry Electronics Corp. 512 Broadway New York 12, New York

94 Evans Radio Inc. Rt. 3A Bow Jct. Concord, New Hampshire

ALPHABETICAL LIST OF MANUFACTURERS

KEY NUMBERS INDICATE DISTRIBUTORS HANDLING THEIR PRODUCTS

AMPEREX ELECTRONIC CORP.

230 Duffy Avenue
Hicksville, New York

Electron Tubes

2, 3, 4, 5, 7, 10, 11, 12, 13, 14, 15, 17, 22, 23, 24, 25, 28, 29, 33, 34, 35, 36, 37, 38, 39, 40, 41, 47, 48, 49, 50, 51, 52, 53, 60, 61, 62, 63, 64, 66, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 91, 94

ANTENNA SPECIALIST CO.

12435 Euclid Avenue
Cleveland 6, Ohio

Mobile Communications Antennas

1, 2, 10, 11, 12, 13, 16, 19, 20, 21, 22, 23, 24, 25, 26, 29, 31, 32, 33, 34, 35, 36, 37, 38, 42, 43, 47, 48, 51, 52, 53, 55, 56 57, 58, 59, 61, 62, 64, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 81, 82, 87, 92

AUTOMATION ELECTRONICS, INC.

1500 W. Vertugo Avenue
Burbank, California

Mobile Communications Receivers

3, 4, 5, 6, 8, 9, 10, 11, 16, 17, 18, 22, 23, 24, 25, 39, 48, 49, 51, 52, 53, 60, 63, 67, 83, 84, 85, 86, 89, 90, 91

BARKER & WILLIAMSON, INC.

Canal Street & Beaver Dam Rd.
Bristol, Penna.

Transmitter, Amplifiers, Baluns, & Components

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94

BASSETT, REX INC.

Ft. Lauderdale, Fla.

Mobile Antennas, Coils and Mounts

2, 3, 4, 5, 8, 9, 10, 11, 14, 19, 20, 21, 22,
24, 25, 27, 29, 31, 32, 36, 37, 38, 42, 43,
45, 46, 48, 49, 51, 52, 53, 54, 60, 61, 62,
65, 67, 87, 89, 90, 92, 94

BLILEY ELECTRIC CO.

Union Station Building
Erie, Penna.

Crystals and Accessories

2, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17,
19, 20, 21, 22, 23, 24, 30, 31, 32, 33, 34,
38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48,
52, 53, 54, 55, 56, 57, 58, 59, 61, 62, 63,
68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78,
80, 81, 82, 83, 87, 91, 94

BUD RADIO, INC.

2118 E. 55th Street
Cleveland 3, Ohio

Code Practice Devices, Metal Cabinets and Racks

2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15,
17, 18, 19, 20, 21, 22, 23 24, 25, 26, 27,
29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39,
41, 42, 43, 47, 48, 49, 51, 52, 53, 54, 55,
57, 58, 59, 61, 62, 63, 64, 66, 67, 68,
70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80,
82, 83, 87, 88, 91, 92, 94

CENTRAL ELECTRONICS, INC.

1247 W. Belmont Avenue
Chicago 13, Illinois

Transmitters, Amplifiers, and Test Equipment

1, 2, 3, 4, 5, 6, 7, 10, 11, 12, 13, 15, 16,
18, 19, 20, 21, 22, 23, 24 25, 26, 27, 28,
32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42,
44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54,
61, 62, 63, 64, 66, 67, 68, 69, 80, 81, 82,
87, 88, 89, 90, 91, 92, 93, 94

CENTRALAB

954K E. Keefe Ave.
Milwaukee 1, Wisconsin

Switches, Components, Transistors—Amplifiers

, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 8, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 0, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 2, 43, 44, 45, 46, 47, 49, 50, 51, 52, 53, 4, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 66, 8, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 0, 81, 82, 83, 84, 85, 86, 88, 91, 92, 94

COLLINS RADIO CO.

855 35th Street, N. E.
Cedar Rapids, Iowa

Receivers, Transmitter

, 2, 3, 4, 5, 7, 10, 11, 12, 13, 15, 18, 22, 23, 4, 29, 34, 35, 36, 37, 38, 39, 42, 43, 49, 51, 2, 53, 60, 61, 62, 63, 64, 66, 81, 82, 83, 87, 1, 92, 94

COLUMBIA PRODUCTS CO.

P. O. Box 5207
Columbia, South Carolina

Mobile Antennas

, 9, 10, 11, 12, 13, 19, 20, 21, 22, 23, 24, 29, 4, 44, 45, 46, 48, 51, 52, 53, 54, 61, 62, 63, 4, 68, 69, 79, 81, 82, 83, 92, 94

COMMUNICATIONS COMPANY, INC.

300 Greco Avenue
Coral Gables 34, Florida

Aviation Communications Receivers and Transmitters

22, 23, 24, 29, 50, 60, 61, 62, 65

CORNELL-DUBILIER ELECTRONIC CORP.

333 Hamilton Blvd.
S. Plainfield, New Jersey

Rotators, Power Supplies and Components

1, 2, 5, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 22, 23, 24, 25, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 55, 56, 57, 58, 59, 61, 62, 65, 66, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 80, 81, 82, 83, 84, 85, 86, 88, 89, 90, 91, 92, 93, 94

CREATIVE ELECTRONICS, INC.

94 Lincoln Avenue
Stamford, Conn.

Transmitter-converters, Vox, Power Supplies and Test Equipment

12, 13, 19, 20, 21, 22, 23, 24, 26, 29, 37, 40, 41, 42, 43, 48, 50, 51, 52, 53, 64, 68, 69

CUSHMAN PRODUCTS

621 Hayward Street
Manchester, New Hampshire

Antennas and Accessories

12, 13, 22, 23, 24, 27, 29, 30, 36, 48, 50, 51, 52, 53, 55, 56, 57, 58, 59, 60, 61, 62, 67, 87, 94

DAROD ELECTRONICS, INC.

54 West First Street
Mt. Vernon, New York

Phone Patches

7, 12, 13, 22, 23, 24, 31, 32, 48, 50, 51, 52, 53, 55, 56, 57, 58, 59, 60, 61, 62, 66, 67, 68, 69, 87, 93, 94

DOW KEY CO., INC.

Warren, Minn.

Keys, coaxial relays, switches and connectors

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 91, 92, 94

E-Z WAY TOWERS, INC.

5901 East Broadway
Tampa 5, Florida

Towers

1, 5, 8, 9, 12, 13, 18, 22, 23, 24, 31, 32, 34, 36, 40, 41, 42, 43, 48, 50, 51, 52, 53, 61, 62, 65, 66, 70, 71, 72, 73, 74, 75, 76, 77, 78, 87, 92

EITEL-McCULLOUGH, INC.

798 San Mateo Avenue
San Bruno, California

Electron Tubes

2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 51, 52, 53, 54, 60, 61, 62, 63, 64, 66, 68, 69, 80, 81, 82, 83, 84, 85, 86, 87, 88, 91, 92, 93, 94

ELDICO ELECTRONICS

72 East 2nd Street
Mineola, New York

Transmitters, Phone Patches, Keyers

1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 34, 35, 36, 37, 38, 39, 40,

41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 60, 61, 62, 63, 64, 66, 67, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 87, 92, 94

ELECTRONIC INSTRUMENT CO., INC.

33-00 Northern Blvd.
Long Island City, New York

Transmitters, Test Equipment

1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 26, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 42, 43, 44, 45, 46, 47, 49, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 66, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 91, 92, 94

FREDERICK TOOL & ENGINEERING CORP.

414 Pine Avenue
Frederick, Maryland

Antennas

3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 18, 22, 28, 35, 36, 37, 38, 39, 42, 43, 47, 51, 52, 53, 55, 56, 57, 58, 59, 60, 61, 62, 63, 65, 66, 67, 84, 85, 86, 87, 89, 90, 92, 94

GENERAL ELECTRIC CO.

Electronics Components Div.
Syracuse, New York

Electron Tubes

1, 3, 4, 5, 7, 10, 11, 14, 16, 17, 18, 22, 23, 24, 27, 28, 29, 30, 31, 32, 33, 35, 36, 38, 39, 42, 43, 44, 45, 46, 47, 48, 49, 51, 52, 53, 55, 56, 57, 58, 59, 61, 62, 63, 64, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 80, 83, 84, 85, 86, 88, 92, 94

GENERAL ELECTRONICS CORP.

4200 Mobile Rd.
Montgomery, Ala.

Transmitters

8, 9, 10, 11, 22, 23, 24, 35, 42, 43, 47, 48, 50, 60, 63, 83, 93

GLAS-LINE CO.

P. O. Box 2
New York 71, N. Y.

Transmission line, guy line, insulators

1, 15, 22, 23, 24, 36, 38, 47, 48, 51, 52, 53, 54, 61, 62, 63, 67, 92, 93

GLOBE ELECTRONICS, INC. (Formerly WRL)

3415 West Broadway
Council Bluffs, Iowa

Transmitters, Amplifiers, and Test Equipment

1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 14, 15, 19, 20,
22, 23, 24, 26, 28, 29, 31, 32, 33, 35, 36,
38, 39, 42, 43, 44, 45, 46, 47, 48, 49, 50,
52, 53, 54, 61, 62, 63, 64, 66, 67, 68, 69,
71, 72, 73, 74, 75, 76, 77, 78, 80, 81, 82,
92, 94

GONSET CO.

801 S. Main Street
Burbank, California

Receivers, Transmitters, Amplifiers, Antennas and Accessories

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14,
16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26,
28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38,
40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50,
52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62,
64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74,
76, 77, 78, 79, 80, 81, 82, 83, 87, 88, 89,
91, 92, 93, 94

GREENLEE TOOL CO.

2371 Columbia Ave.
Rockford, Illinois

Hole punching tools

1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15,
22, 23, 24, 25, 26, 28, 29, 31, 32, 33, 35,
37, 38, 40, 41, 42, 43, 44, 45, 46, 47, 48,
54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64,
69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 80,
82, 83, 87, 91, 94

HALLICRAFTERS CO.

4401 W. 5th Avenue
Chicago 24, Illinois

Receivers, Transmitters and Amplifiers

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14,
16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27,
29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39,
41, 42, 43, 44, 45, 46, 47, 48, 49, 51, 52,
54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64,
67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77,
79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89,
91, 92, 94

HAMMARLUND MFG. CO., INC.

460 West 34th Street
New York 1, New York

Receivers and components parts

1, 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15,
17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27,
29, 31, 32, 33, 35, 36, 37, 38, 39, 40, 41,
43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53,
55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 66,
68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78,

0. 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91,
2, 93, 94

HEXACON ELECTRIC CO.

161 West Clay Street
Roselle Park 9, N. J.

Soldering guns and irons

, 8, 9, 10, 11, 22, 23, 24, 28, 31, 32, 35, 36,
7, 38, 42, 43, 44, 45, 46, 47, 51, 52, 53, 63,
5, 68, 69, 80, 87, 88, 93, 94

HORNET ANTENNA PRODUCTS CO.

P. O. Box 806
Duncan, Oklahoma

Antennas and accessories

22

HY-GAIN ANTENNA PRODUCTS CO.

1828 North Street
Lincoln, Nebraska

Antennas, rotators, mounts and accessories

, 2, 3, 4, 5, 7, 8, 9, 10, 11, 14, 15, 17, 18, 19,
0, 21, 22, 23, 24, 26, 27, 28, 29, 30, 33, 34,
5, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46,
7, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58,
9, 60, 61, 62, 63, 64, 66, 67, 68, 69, 70, 71,
2, 73, 74, 75, 76, 77, 78, 80, 81, 82, 83, 84,
5, 86, 87, 91, 92, 94

ILLUMITRONIC ENGINEERING

Sunnyvale, California

Coils, inductors, baluns and transmission lines

, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17,
8, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29,
1, 32, 33, 34, 35, 36, 37, 38, 39, 47, 48, 49,
0, 51, 52, 53, 54, 60, 61, 62, 63, 64, 66, 67,
8, 69, 80, 81, 82, 87, 91, 92

NTERNATIONAL CRYSTAL MFG. CO., INC.

18 North Lee Street
Oklahoma City 2, Oklahoma

Transmitters, crystals, and accessories, printed circuit amplifiers, test equipment

0, 11, 22, 34, 50, 61, 62, 63, 65

JOHNSON, E. F. CO.

Waseca, Minn.

Transmitters, Amplifiers, Antennas, Rotators and Components

, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15,
6, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27,
8, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39,
0, 41, 42, 43, 44, 45, 46, 47, 48, 49, 51, 52,
3, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64,
66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77,
78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89,
90, 91, 92, 93, 94

L W ELECTRONICS LABS

Route 2
Jackson, Michigan

Transmitters, Converters

2, 5, 18, 22, 26, 38, 48, 51, 52, 53, 61, 62, 63

LAKESHORE INDUSTRIES

Manitowoc, Wisconsin

Transmitter, Amplifiers

1, 2, 5, 8, 9, 10, 11, 18, 19, 20, 21, 22, 23, 24,
34, 35, 36, 37, 39, 42, 43, 47, 48, 49, 51, 52,
53, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65,
66, 67, 68, 69, 83, 87, 92, 94

MARK MOBILE INC.

6416 W. Lincoln Ave.
Morton Grove, Illinois

Mobile Antennas

1, 2, 7, 10, 11, 15, 18, 22, 23, 24, 35, 36, 37,
38, 39, 48, 50, 51, 52, 53, 61, 62, 63, 66, 80,
81, 82, 87, 92, 94

MASTER CRYSTAL LABS

1306 Bond Street
Los Angeles 15, California

Crystals and accessories

8, 9, 10, 11, 16, 22, 39, 48, 51, 52, 53, 55, 56,
57, 58, 59, 60, 63, 67, 92

MASTER MOBILE MOUNTS, INC.

1306 Bond Street
Los Angeles 15, California

Mobile antennas, mounts, and coils, field strength meters, crystals

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15,
16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28,
31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42,
43, 44, 45, 46, 47, 48, 49, 50, 51 52, 53, 54,
55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66,
67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78,
79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90,
91, 92, 94

MILLEN MFG. CO., INC. JAMES

150 Exchange Street
Malden 48, Massachusetts

Transmitter, amplifier, power supplies, component parts, test equipment

1, 5, 7, 10, 11, 12, 13, 14, 18, 19, 20, 21, 22,
23, 24, 27, 30, 33, 35, 38, 40, 41, 42, 43, 44,

45, 46, 47, 48, 50, 51, 52, 53, 54, 60, 61, 62, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 80, 81, 82, 87, 88, 91, 92, 94

MORROW RADIO MFG. CO.

2794 Market Street
Salem, Oregon

Receivers, Transmitters, Power Supplies

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 80, 84, 85, 86, 87, 89, 90, 91, 92, 93, 94

MOSLEY ELECTRONICS, INC.

8622 St. Charles Rock Rd.
St. Louis 14, Mo.

Antennas and accessories

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 89, 90, 91, 92, 94

NATIONAL CO., INC.

61 Sherman Street
Malden, Massachusetts

Receivers, Component Parts

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 94

P & H ELECTRONICS, INC.

424 Columbia
Lafayette, Indiana

Transmitters, Amplifiers, Test Equipment

2, 5, 10, 11, 22, 23, 24, 26, 29, 35, 37, 48, 51, 52, 53, 60, 61, 62, 63, 66, 81, 82, 87, 94

PALCO ENGINEERING

355 N. Columbia St.
Frankfort, Indiana

Transmitters, Power Supplies

5, 10, 11, 22, 23, 24, 36, 39, 42, 43, 48, 51, 52, 53, 61, 62, 66, 67, 87, 89, 90

PETERSEN RADIO CO.

2800 W. Broadway
Council Bluffs, Iowa

Crystals and Accessories

1, 2, 3, 4, 5, 6, 7, 10, 11, 12, 13, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29, 31, 32, 33, 34, 35, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 51, 52, 53, 54, 60, 61 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 87, 91, 92, 94

RCA ELECTRON TUBE DIV.

Harrison, New Jersey

Electron Tubes

7, 8, 9, 10, 11, 12, 13, 14, 15, 19, 20, 21, 22, 23, 24, 25, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 55, 56, 57, 58, 59, 61, 62, 63, 66, 68, 69, 80, 83, 87, 88, 9

RADIO PUBLICATIONS, INC.

Danbury Rd.
Wilton, Connecticut

Books

1, 2, 5, 7, 12, 13, 14, 19, 20, 21, 22, 23, 24, 30, 33, 34, 35, 36, 37, 39, 40, 41, 42, 43, 47, 48, 50, 51, 52, 53, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 80, 81, 82, 83, 87, 92, 94

RAFRED ENTERPRISES

Box 47725 Wagner Station
Los Angeles 47, Calif.

Mobile Antennas

5, 6, 7, 10, 11, 18, 19, 20, 21, 22, 23, 24, 26, 35, 36, 37, 39, 40, 41, 48, 51, 52, 53, 60, 66, 67, 87, 92, 94

REGENCY DIV. OF IDEA, INC.

7900 Pendeton Pike
Indianapois 26, Indiana

Receivers and Converters

1, 2, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 22, 23, 24, 26, 27, 28, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 55, 56, 57, 58, 59, 61, 62, 63, 64, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 80, 83, 87, 88, 91, 92, 94

RIDER PUBLISHING, INC., JOHN F.

116 W. 14th Street
New York 11, New York

Books

1, 3, 4, 5, 6, 7, 8, 9, 12, 13, 14, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33

4, 35, 36, 37, 38, 39, 40, 41, 42, 43, 47, 48, 0, 51, 52, 53, 55, 56, 57, 58, 59, 61, 62, 63, 4, 66, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 8, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 92, 4

ROHN MFG. CO.

116 Limestone
Bellevue, Peoria 5, Ill

Towers and Accessories

, 2, 5, 7, 8, 9, 10, 11, 12, 13, 18, 19, 20, 21, 2, 26, 29, 31, 32, 33, 34, 37, 38, 39, 40, 41, 2, 43, 47, 48, 50, 51, 52, 53, 60, 61, 62, 63, 7, 70, 71, 72, 73, 74, 75, 76, 77, 78, 80, 83, 4, 85, 86, 87, 89, 90, 92, 94

SKY-LANE PRODUCTS

5320 Nebraska Avenue
Tampa 3, Florida

Antennas

22, 48

TECHNICAL MATERIEL CORP.

700 Fenimore Rd
Mamaroneck, New York

Receivers and Transmitters

1, 2, 5, 10, 11, 12, 13, 17, 22, 23, 24, 29, 31, 32, 35, 36, 39, 42, 43, 48, 49, 51, 52, 53, 61, 62, 63, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 83, 87, 91, 94

TELEVUE TOWERS, INC.

701 49th Street, So
St. Petersburg, Florida

Towers and Accessories

1, 10, 11, 12, 13, 22, 23, 24, 36, 50, 51, 52, 53, 61, 62, 67, 81, 82, 89, 90

TAPETONE, INC.

10 Ardlock Pl.
Webster, Mass.

Transmitters and Converters

1, 2, 5, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 22, 23, 24, 29, 31, 32, 34, 35, 37, 38, 39, 49, 50, 51, 52, 53, 63, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 81, 82, 87, 89, 90, 94

TELECOM, INC.

1019 Admiral
Kansas City, Mo.

Power Supplies

5, 6, 10, 11, 17, 22, 23, 24, 29, 39, 60, 61, 62, 64, 66, 68, 69, 80, 91, 94

TELREX, INC.

Asbury Park 2, N. J.

Antennas, Rotators and Accessories

5, 7, 10, 11, 12, 13, 15, 18, 22, 23, 24, 26, 29, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 66, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 87, 89, 90, 91, 92, 94

TRIAD TRANSFORMER CORP.

4055 Redwood Avenue
Venice, California

Transformers and Chokes

2, 3, 4, 5, 7, 10, 11, 14, 17, 22, 23, 24, 28, 29, 30, 33, 34, 35, 37, 39, 42, 43, 47, 51, 52, 53, 60, 61, 62, 63, 70, 71, 72, 73, 74, 75, 76, 77, 78, 80, 84, 85, 86, 87, 88, 92, 94

TRI-EX TOWER CORP.

127 E. Inyo Street
Tulare, California

Towers and Accessories

1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 16, 17, 19, 20, 21, 22, 23, 24, 29, 31, 32, 36, 37, 39, 48, 50, 51, 52, 53, 60, 61, 62, 64, 65, 67, 68, 69, 80, 87, 92, 94

VAN NORMAN INDUSTRIES, INC.

Manchester, New Hampshire

Amplifiers and Switches

1, 2, 3, 4, 8, 9, 14, 15, 16, 18, 22, 23, 24, 31, 32, 35, 36, 40, 41, 44, 45, 46, 48, 50, 61, 62, 63, 66, 68, 69, 79, 80, 83, 84, 85, 86, 87, 93, 94

VESTO CO., INC.

20th and Clay Street
No. Kansas City, Mo.

Towers and Accessories

8, 9, 22, 23, 24, 47, 48, 61, 62, 64

VIBROPLEX CO., INC. THE

833 Broadway
New York 3, New York

Keys

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 28, 29, 30, 31, 32, 33, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 66, 67, 68, 69, 79, 80, 81, 82, 83, 87, 89, 90, 91, 92, 94

"AC" Coil for HRO-50T1

Oliver Wilson, VE6WT

3623 Sixth St., S.W.
Calgary, Alberta, Canada

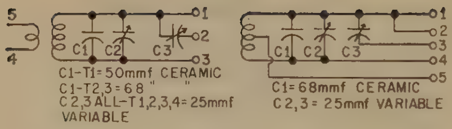


Fig. 1

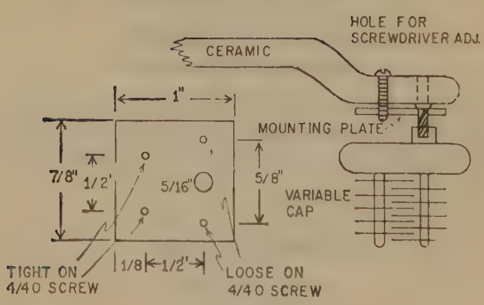


Fig. 2

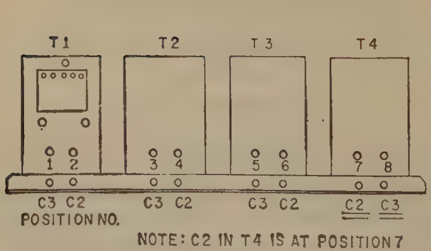


Fig. 3

The "AC" coil for the HRO 50T1 is pra tically a collector's item and is no longer production. Here is how to modify the "C coil to cover the band. If you have no "C coil, broadcast band coil or any spare coil ma be you can buy one easier than the "AC" co Butchering the "G" coil does not affect th saleability of the receiver itself and is no lo unless you happen to be also interested in th aircraft radio range signals.

The "G" coil—like the rest of the set- consists of 4 RF transformers. The cans a held together by the name plate and loosenin —**not removing**—4 screws lets you see insides. Start with G.4—it's marked—or if n it is the right-hand one when you face th receiver. Loosen the screws and remove from the name plate. Now take out the 3 screw holding the ceramic slab to the can. Watch fo washers between ceramic and can and remem ber where they were. There are probably non but may be in some cases. This ceramic sla has 2 variable capacitors mounted and a husk oscillator coil—as you would expect—for 65 855 kc. If you are scared and want to repla the "G" coils later, then mark the 3 wir coming from the coil with the number of th terminal to which they are soldered. Remo this coil and the shorted turn which is mount with it. Wind a coil of 6 turns of #22, form covered, on a half inch diameter form an space to 3/8 inch. Clear insulation and ta a tap at 4th turn. I used the coil forms out a SCR522 receiver, which I had previous modified, and they will mount in the sam place as the original coil by enlarging th mounting hole—in the aluminum bracket- not the ceramic, old boy! Clip out the 1 mmfd ceramic fixed capacitor and repla with a 68 mmfd ceramic. Wiring diagram shown in fig. 1. Replace this in the can a hope for the best.

Now remove T3 (second from the right as before). Take out coil and discard or save (are you a squirrel?) We now have bad news. There is only one trimmer in this can. Buy 4 of the 25 mmfd variables with screwdriver adjustment and with mounting block about ¼ inch high—if possible—otherwise the standard 25 mmfd will have to do. Make 4 plates of 1/32" brass (panel out of a 1926 Fada TRF) ⅞ inch by 1 inch and drill as per fig. 2. Use flat head 4-40 screws and fasten plate to the variable. Now run 4-40 screws through holes in ceramic which are there in just the right spots and thread them into the brass plate. I cut the threads with a spare bolt first—broke only one bolt! The second trimmer is now mounted. Install 68 mmfd ceramic as per wiring diagram. Wind coil of 5½ turns #22 on ½ inch form as before. Wind coupling coil of 9 turns #26 formel next to it and the whole works will space nicely to ⅛". I wound 6 turns of the #22 and then when soldering in place left the excess sticking out from the side of the coil so it could be bent around to make minor adjustments to the inductance. Remount in can after wiring. Replace washers if there were any.

Follow same plan for T2—the next in line.

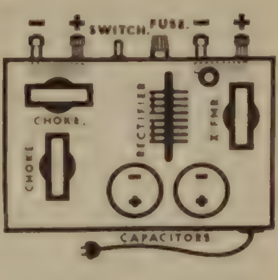
The T1 can has no trimmers so you use up the rest of your plates and variables on it. I used the same coils as for T2 and T3 except that I used only four turns of the #26 wire as an antenna link. This T1 has a 50 mmfd ceramic instead of the 68 mmfd in it.

Replace and align—just like that. Alignment took me 3 days of wondering and experimenting but I didn't have the coils right. When they were, it took only about ten minutes. Radio W1WO and KCBR are just above the 15 meter band. I finally got W1WO and set it at 4 mcs (on the "D" scale) and then trimmed and padded until 3.5 mcs (on the "D" scale) was receiving a 7 mcs (21 mcs) signal from my BC221. Alignment is theoretically done as follows:

Set dial at 4 mcs (21.5) signal source at 21.5 mcs and rotate variable at position 7 to hear signal. Adjust variables at positions 6, 4 and 2 for best S meter reading. Move signal source to 21 mcs. Set dial at 3.5 mcs (21 mcs.) and tune position 8 variable to hear signal. Tune positions 5, 3 and 1 for best S meter reading. Repeat this procedure a couple of times and then try it on the band. You should —if you have the patience, adjust the inductances at 21.3 (3.8 on the dial) for best peak results. I was not so fussy.

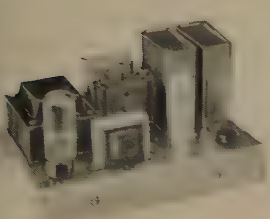
Net cost 4 variables $1.40, screws, wire, etc., 10¢. Labour—first time about one weekend—second time would be about three hours or less. Any coil of the HRO 50 series will do and if it has the whole 8 trimmers mounted so much the better. Position diagram and mounting details for all units are shown in fig. 3. ■

New Amateur Equipment



Transistor Power Supply Kit

Ho, Ho! This isn't what you thought at all. This is a power supply for powering transistors. It supplies you well filtered outputs of 12 volts at 1 amp . . . in series that is 24 volts at 1 amp. The kit is put out by Technical Apparatus Builders and costs $18.00. They have an elaborate info sheet available if you circle I on page 194.



Command Set Power Supply

G & G Radio Supply (NY) has a power supply kit which is specially designed for the Command Set transmitters BC-457, 458, 459, etc. It furnishes 450 volts @ 150 ma for the final, 250 volts @ 50 ma for the oscillator and 24 volts @ 2 amps for the filaments. A supply like this makes for a minimum of conversion of the transmitter and modulator. Want all the details? Circle I on page 194 and we'll have G & G get some literature out to you.

ween 1.3 to 1 and 2 to 1. Use of the 27 mc band is not authorized in Japan, and we made no tests there. Front-to-back ratios were in the neighborhood of 20 to 30 db on 14 and 21 mc, and were about 10 db from 28 to 29 mc. Front-to-side ratios were about 50 db on 14 and 21 mc, and about 25 db on 28 mc.

The antenna performed quite well. In many cases we were reported as the loudest KA/JA station on the three bands. Generally, two or three stations were reported as slightly better. However, these stations were running several db more power than our normal 480 watts, and their antennas ranged from three elements at 110 feet to stacked rhombics over salt water. In the 1956 ARRL DX contest, I was on cw for 34 hours and worked 657 stations on the three bands. During the last thirty days of operation in Japan, we worked 102 countries.

One trouble did develop with the antenna. The variables all flashed over because of the high humidity. The variables were replaced with capacitors made of sections of RG/8/U. Tuning was done by first getting s.w.r.'s down to 1 to 1 with variables, inserting slightly more than the estimated required length of RG/8/U, then clipping the coax half an inch at a time until the s.w.r. was again 1 to 1. No further trouble was had. I recommend this system highly to those who haven't been able to keep their gamma capacitors dry. This also eliminates the nuisance of providing enclosures for variables.

Rotators aren't easily available on the Kanto plains so we rigged up a cheap, crude and effective "Armstrong Rotator" using wooden disks, aircraft control cable and pulleys.

Immediately after returning to the States, I received change-of-station orders to North Carolina. So, the last of the W5DWT antennas had to be pulled down. This monstrosity, built on a 30-foot ladder boom, used several elements, loading coils, capacitors, relays, etc., to cover all bands from 7 through 28 mc. When it worked, the performance was fine. Unfortunately, I'd spent more time replacing relays and coils that I'd burnt up because of sticking relays than I had in operating. In the North Carolina climate, which is considerably damper than that of Albuquerque, I could expect even more trouble. Obviously, an interlaced beam with no relays was called for, after my experience with the KA2EC beam.

The first beam planned would have used the 30-foot boom, and would have had four elements on 14 and 21 mc, and five on 28 mc. This was vetoed by the distaff side. More calculation resulted in the beam shown in fig. 2. The 24-foot boom was formed of two magnesium ladders bolted together. This length was used because it is about optimum for a 14 mc beam, considering gain, swr, and bandwidth. The position of the 14 mc elements was determined by the length of the boom. The other elements were stuck in where they would fit best. Again the earlier formula for 14 and 21 mc was used, with one change. The radiator length was set to 472/F. The 28 mc elements were calculated so as to resonate the director at 30 mc, the radiator at 28.5 mc, and the reflector at 26.5 mc, to give us wide bandwidth, at some sacrifice in gain. The 14 and 21 mc elements were insulated from the boom and crossarms by some ½" lucite blocks cut from a sheet obtained on the surplus market. The 28 mc elements were insulated from the boom by 1"x3"x24" oak crossarms. (Oak flooring costs two bits per ten feet.) The elements were insulated from the boom because previous beams which had elements mounted directly on ladder booms had demonstrated that the boom affected element lengths materially.

The beams were checked for tuning on the roof by using a grid-dip meter. Gamma matches were shorted at this time, and all elements appeared to be the correct length. (Radiators resonant in the bands, reflectors below, and directors above.) Then the gammas were tuned. The 14 and 28 mc gammas tuned up normally. However, the 21 mc gamma was abnormally short, and required a very high amount of capacitance to bring the swr down. This gamma was disassembled and rebuilt, but we came up with the same figures. The gammas were set for 1 to 1 swr's on the roof at 14100, 21150, and 28400 kc. When the beam was mounted on a 60-foot tower, the swr's were down to 1 to 1 at 14170, 21200, and 28430 kc. The swr's were below 1.25 to 1 across 14 and 21 mc, and ran about 1.4 to 1 at 28 and 29 mc. At 27 mc, the swr was back down to 1.2 to 1, and at 29.7 mc was 1.5 to 1, and hit a maximum of 1.7 to 1 at 29.4 and 27.6 mc.

Front-to-back ratios are about 20 db across 21 and 14 mc, and varies between 8 and 20 db across the 27 and 28 mc bands. These are normal F/B ratios for beams with similar spacings under average band conditions. Of course, they can be improved upon materially by picking a given angle of signal arrival, or a particular antenna height. For example, this 14 mc beam shows a discrimination in the order of 50 db when our pet power leak is "off the back." Front-to-side ratios on all three beams showed the usual 50 to 60 db discrimination. This, of course, applies to signals directly off the ends of the elements, and may apply only over a range of 5 to 10 degrees

[*Continued on page 148*]

These gals enjoyed the YL Breakfast held Sunday morning during the West Gulf Division Convention in Oklahoma City, July 25-27, 1958. L. to r., seated: W5EGD, KN5PBE, K5IPG, W5JCY, KN5OPT, K5LKF, K5MBS, W5KGQ. Second row: KNLQX, WØGIC, KN5LAE, W5JAP, K5GMI, K5BNB, KN5QJD, K5COZ, W5WPR, W5DUR, W5MJU, KØGZO, KL7AZI, W1CIE, W5AMI, W5OQT. Top row: W5CCK, W5KEC, K5BNQ, KØLTJ, K5BNH, K5BDL, KN5QAK, W5TSE, K5CPA, K5BLP, W4UDG, W5PWN, W5GPN. Photo by N.G. Morris.

YL

by LOUISA B. SANDO, W5RZJ
212 Sombrio Drive, Santa Fe, N. M.

19th YLRL Anniversary Party

Given elsewhere in this column are the rules for YLRL's 19th Anniversary Party. Note the dates: Nov. 12-13 for the phone section; Nov. 19-20 for cw. Two changes of special interest: each section of the contest will be limited to 24 hours (instead of 36 as previously), and there is now an award offered for the highest score turned in by a Novice. All YLs everywhere, whether or not members of YLRL, are invited to participate in this contest. Join the fun, gals—meet old friends and make new ones!

YLRL Officers for 1959

Congratulations to these newly elected officers of the Young Ladies Radio League. They will take over their duties on Jan. 1, 1959.

President: W4BLR, Katherine Anderson, Richmond, Va.

Vice president: W6DXI, Gladys Eastman, Glendale, Calif.

Secretary: K6EXQ, Connie Hauck, Pomona, Calif.

Treasurer: W9YWH, Evelyn Tibbits, Western Springs, Ill.

Publicity chairman: W9RUJ, Mary

Meyer, Brookfield, Wis.
Editor: K6ENK, Wanda Gluck, Fair Oaks, Calif.

District Chairmen: W1ZEN, Onie Woodward; K2JYZ, Lillian Byrne; W3GTC, Carolyn Currens; K4BKT, Sue Cable; K5IMD, Betty Vredenburg; W6MWU, Mary Poe; W7DIC, Bessie Jeans; W8ATB, Esther Stuewe; W9UXL, Lois Zehr; KØJAS, Laura Stegner; KH6BGE, Flo Kumukahi; KL7BHE, Sheila Goodhue; VE6MP, Maude Phillips.

W4BLR, Kay, has served as YLRL's vice president during 1958. Licensed in '53, Kay and her OM, W4BVB, have four jr. ops. She holds CPC-30 and won the '56 YL-OM cw contest. For a photo and other details see this column in CQ for Dec. '57.

W6DXI, Gladys, has been licensed since 1950. Her OM is W6AWI, and their daughter Frances is K6EJE. She has served as D/C for YLRL and as president of Los Angeles YLRC. The "new look" in their shack consists of a Central Electronics 20A SSB exciter which Gladys put together from the kit, a 300-watt final which she helped to assemble, and an SX-100 receiver. W6DXI also works 2 meters. Another new piece of audio frequency electronic gear they are enjoying is a Hammond organ.

K6EXQ, Connie, was licensed as a Novice in 1954 and became a General a year later. She and her OM, K6DQA, use a Viking 500 on 10, 20 and 40. Connie has been NCS of the Hairpin Net for two years, and is a member of the Los Angeles YLRC. She has several certificates from foreign countries and the States, as well as YLCC with 5 stickers, and needs only Nev., Utah and Del. for WAS/YL. She is active in CD work (RACES). Connie has a son 12 and a daughter 10, and has been a den mother and a girl scout leader for two years, as well as active in PTA. Other Ham relatives include W6 YFT, YFF, AQP and K6QPE and they often have 40-meter family roundtables.

W9YWH, Evelyn, was licensed in 1953, the first Ham in her family. Her OM then became W9RYL and now daughter Margot is KN6OWH and son-in-law is KN6OWG. The Tibbits have another grown daughter and Evelyn is an ardent grandmother. Past president of LARKs, active in Quaker work, she likes flowers, sewing and reading. Station gear consists of a Valiant transmitter, SX-100 receiver with a trap antenna for 80, 40, 20, 15, and a vertical for 10 meters.

W9RUJ, Mary has served as P/C during 1958. For photo and write-up, see this column in CQ for Jan. '58.

K6ENK, Wanda, also carries over her job as editor of *YL Harmonics* from 1958. For photo check CQ for Aug. '58. Wanda earned her Novice license in 1954, six months after her OM became K6BNB. She studied with her next door neighbor, Aleta, now K6ENL, and for the first two years worked cw only. Now she operates 80, 40 and 20 phone and cw and they are working on a 2-meter set-up. K6ENK is ANCS for the MARS net to which she belongs and is in RACES. She is president of the 3C's club and edits their paper. She holds a number of certificates and has 80 DX countries confirmed. There are three jr. ops; the oldest, Linda, is KN6PBG, and the two boys are interested. Wanda also finds time to be active in church affairs.

YLRL membership is growing at a great rate—as of mid-September it totaled 830 YLs, and is still climbing. Any licensed YL is eligible to join: drop your column editor a card for more details.

W6DXI, Gladys Eastman, YLRL vice president for 1959.

YLRL Certificate Directory

The YLRL is now offering a special certificate and contest Directory. It contains information about and the rules covering YLCC, WAS/YL, WAC/YL and DX/YL certificates and YLRL A.P. and YL/OM contests. Copies are available for 25¢ each from K6HHD, Jan O'Brien, 3417 6th Ave., Sacramento, Calif.

YLRL also has available cuts of the diamond-shaped YLRL insignia for use on QSL cards. They sell for $1.50, postpaid, and can be obtained from the current treasurer, W6QGX, Harryette.

K6EXQ, Connie Hauck, secretary of YLRL for 1959.

10th National Convention

Sixty-four YLs registered for the National Convention held in Washington, D.C., Aug. 15-17. Since the convention will be well cov-

d by W1QON in her column and the YLRL rum in *YL Harmonics*, we'll hit only a few hlights. In addition to the general conven- n activities, popular features for the YLs d XYLs were the ladies luncheon, fashion ow, SWOOP, silly hat contest, YLRL Forum d tours. The YLRL session was arranged W3CDQ, Liz, and conducted by W3RXJ, ene. Speakers included K4LMB, Ethel; 1QON, Eleanor; W4BLR, Kay; W3PVH, tty, and W4TVT, Claire, conducted the en forum. The mink scarf was won by the l of W4DRV. W3BIW, Eleanor, and OM 3BUX won a trip to New York City, and 4RAU, Hester, won a 40' TeleVue crankup wer. Others won prizes at the ladies luncheon d YLRL session.

Those attending: W1 CEW, HOY, QON, YM, K1HMW; KN1GYY; W2 EEO, LHK, WI, RUF; K2, AUE, HWM, LUR, MGE, KQ; WA2AJU; W3 AKB, BIW, CAI, CDQ, LL, CZT, DHL, GTC, PVH, RXJ, SLS, SC, URU, UTR, UXU, WML, WRE, ZUF; 3BLG; W4 BAV, BLR, HLF, SGD, TDK, VT, VCB 3; K4 CZP, GKO, GUD, LMB, IR, RAU, RBU; W6BIS; K6KUP; W8 SSF, FZ, K8ARA; W9 GME, RTQ, RUJ; 9DCC; WØ CMV, ZTH; KØ BFS, LYV; O2WI, KV4BU.

As a result of the convention, on Aug. 21 3CDQ, Liz, and K4LMB, Ethel, were in- rviewed on the NBC program Capital By- nes

W9YWH Evelyn Tibbits, YLRL treasurer for 1959

Work DX?

Don't forget the CQ-sponsored World Wide DX Contest—the phone section is the last weekend in October and cw the last weekend in November. . . . Congrats to these YLs for earning the WAZ DX award—YL number 6 to make WAZ is K6ENL, Aleta Cash, while the 7th YL to achieve the award is ZS1RM, Margery Snyman.

"CQ YL"

Ordered your copy yet? Ham magazines and newssheets all across the country have been carrying news of this first and only book about the YLs. W2JZK, Editor of G-E HAM NEWS, writes, "Both the XYL and I enjoyed reading 'CQ YL.' It is hard to realize how much the YLs have done for amateur radio until their accomplishments were documented in your book." 18 chapters, 500 photographs, it covers all phases of YL participation in Ham radio. Order from your column editor, W5RZJ (address beginning of column), $3.50, postpaid, and autographed.

33, Louisa, W5RZJ

YLRL 19th Anniversary Party Rules

Phone:	Start Nov. 12, 1958 at 12 noon EST. End Nov. 13, 1958 at 12 noon EST.
Cw:	Start Nov. 19, 1958 at 12 noon, EST. End Nov. 20, 1958 at 12 noon EST.
Eligibility:	All licensed YL and XYL operators throughout the world are invited to participate. YLRL members are eligible for the cup awards. Non members will receive a certificate. Only YLRL affiliated clubs will be eligible for the club award. Contacts with OMs will not count. The YL/OM contest will be held in the spring of 1959.
Operation:	All bands may be used. Cross-band operation is not permitted. Only one contact with each station will be counted in each contest.
Procedure:	Call "CQ YL."
Exchange:	QSO number, RS or RST report, name of State, U.S. possession, VE district or country. California stations will include the name of their section in the QSO. California is divided into eight (8) sections as follows: Santa Clara Valley, East Bay, San Francisco, Sacramento Valley, San Joaquin Valley, Los Angeles, San Diego and Santa Barbara.
Scoring:	(a) Phone and cw sections will be scored as separate contests. (b) Multiply number of contacts by the number of different States, sections, U.S. possessions, VE districts and countries worked. (Maryland and the District of Columbia count as one state) (c) Contestants running 150 watts input or less at all times may multiply the result of (b) by 1.25 (low power multiplier).
Logs:	Copies of all logs showing claimed score, must be postmarked not later than Nov. 30, 1958 or they will be disqualified. Send logs directly to the YLRL Vice President, Kay Anderson, W4BLR, 5210 Raleigh Rd., Richmond 23, Va.
Awards:	Highest phone score gold cup. Highest cw score gold cup. Highest phone and cw scores in each district, U.S. possession, VE district and country will receive a certificate.
Club Award:	A gavel will be awarded to the club submitting the highest "average" score. Club secretaries should total the scores of all participating membres and arrive at an average score by dividing this total by the number of club members participating. Send this information to the vice president for confirmation.
Novice Award:	A certificate will be given to the Novice YL with the highest cw score.

LAST MINUTE FORECAST FOR NOVEMBER

November 29th, the first day of the cw contest, may be somewhat disturbed but good short wave propagation conditions are forecast for the remainder of the contest period. A moderate radio storm is forecast for the period November 16-19 and 27-28. Exceptionally good conditions are expected November 4-9. Send a self-addressed stamped envelope direct to W3ASK for a final forecast to be made one week before the cw contest period.

NOVEMBER, 1958

All Times in C. S. T.

CENTRAL USA TO:	*6/10 METERS	15 METERS	20 METERS	40/80** METERS
Western & Southern Europe	8A-10A (2)* 6A-9A (3) 9A-2P (4) 2P-6P (2)	6A-8A (3) 8A-11A (2) 11A-2P (4) 2P-5P (3) 5P-8P (2)	11A-3P (3) 3P-8P (4) 8P-11P (3) 11P-11A (2)	5P-12M (3) 7P-11P (1)**
Central & Eastern Europe	6A-8A (2) 8A-11A (3) 11A-1P (2)	5A-8A (3) 8A-11A (2) 11A-1P (3) 1P-3P (2) 3P-5P (1)	6A-12N (1) 12N-8P (2) 8P-11P (3) 11P-6A (2)	6P-12M (1) 8P-11P (1)**
North & West Africa	8A-11A (1)* 7A-10A (2) 10A-12N (3) 12N-4P (2)	5A-11A (2) 11A-3P (3) 3P-8P (2) 8P-10P (1)	5A-7A (2) 7A-1P (1) 1P-6P (3) 6P-1A (2) 1A-5A (1)	6P-1A (2) 9P-12M (1)**
Central & South Africa	10A-1P (1)* 6A-11A (3) 11A-2P (4) 2P-6P (3) 6P-8P (1)	5A-11A (1) 11A-2P (2) 2P-7P (3) 7P-10P (2)	1P-6P (2) 6P-10P (3) 10P-2A (2) 2A-6A (1)	7P-12M (2) 9P-11P (1)**
Near & Middle East	6A-10A (2) 10A-12N (1)	9A-2P (2) 2P-4P (1)	11A-2P (2) 2P-5P (1)	6P-9P (1)
South America, Northern Area	9A-6P (2)* 7A-3P (4) 3P-6P (3) 6P-9P (2)	5A-8A (3) 8A-2P (2) 2P-8P (4) 8P-10P (3) 10P-5A (2)	5A-7A (3) 7A-2P (1) 2P-4P (2) 4P-1A (4) 1A-5A (2)	7P-6A (3) 8P-3A (1)**
Argentina, Chile, etc.	9A-12N (2)* 3P-6P (1)* 6A-3P (3) 3P-7P (4) 7P-9P (2)	6A-2P (2) 2P-8P (3) 8P-12M (2) 12M-6A (1)	5A-8A (3) 8A-3P (1) 3P-10P (3) 10P-5A (2)	7P-4A (2) 8P-3A (1)**
India, Pakistan & Central Asia	7A-9A (1) 8P-9P (1)	7A-10A (2) 5P-9P (2)	6A-11A (2) 5P-9P (2)	Nil
Malaya & Southeast Asia	8A-1P (2) 4P-7P (2)	7A-10A (2) 10A-2P (1) 2P-5P (2) 5P-8P (3) 8P-10P (2)	5A-9A (2) 4P-12M (2)	Nil
Philippine Islands & East Indies	7A-10A (1) 5P-7P (2)	7A-10A (1) 5P-9P (2)	6A-8A (1) 5P-10P (2) 10P-1A (1)	Nil
Japan & Far East	3P-6P (1)* 2P-4P (2) 4P-7P (3) 7P-9P (2)	6A-9A (1) 2P-4P (2) 4P-8P (3) 8P-10P (2)	10A-7P (1) 7P-9P (2) 9P-2A (3) 2A-10A (2)	12M-7A (1)
Australasia	3P-6P (1)* 8A-11A (3) 11A-3P (2) 3P-7P (4) 7P-9P (3)	7A-10A (3) 10A-4P (2) 4P-10P (3) 10P-1A (2)	4P-9P (1) 9P-12M (2) 12M-4A (4) 4A-9A (3)	2A-8A (3) 4A-7A (2)**
Guam & Pacific	4P-6P (1)* 8A-11A (1) 4P-8P (3) 8P-10P (2)	8A-11A (2) 4P-6P (2) 6P-9P (3) 9P-11P (2)	7P-10P (2) 10P-3A (3) 6A-8A (2)	10P-1A (1)
Hawaii	11A-5P (2)* 10A-12N (3) 12N-7P (4) 7P-9P (3)	10A-4P (3) 4P-9P (4) 9P-12M (3) 12M-2A (2)	4P-6P (3) 6P-4A (4) 4A-10A (3) 10A-4P (2)	10P-7A (4) 11P-6A (3)**
Antarctica	7A-9A (1) 6P-10P (1)	6A-9A (2) 9A-2P (1) 2P-10P (3) 10P-12M (2)	3P-7P (1) 7P-9P (2) 9P-3A (3) 3A-8A (2)	12M-3A (2)

NOVEMBER, 1958

All Times in P. S. T.

Western USA TO:	*6/10 METERS	15 METERS	20 METERS	40/80** METERS
Western & Central Europe	6A-8A (2) 8A-10A (3) 10A-12N (2) 12N-2P (1) 2P-5P (2)	6A-9A (2) 9A-12N (3) 12N-3P (2) 3P-5P (1)	7A-9A (2) 9A-2P (1) 2P-6P (3) 6P-4A (2)	7P-11P (1)
Southern Europe & North Africa	8A-11A (1)* 6A-8A (2) 8A-11A (3) 11A-2P (2)	6A-10A (2) 10A-12N (4) 12N-2P (3) 2P-4P (2)	5A-12N (1) 12N-4P (2) 4P-7P (3) 7P-5A (2)	7P-11P (1)
Central & South Africa	8A-3P (1)* 6A-9A (1) 9A-1P (2) 1P-3P (3) 3P-7P (2)	8A-11A (1) 11A-2P (2) 2P-7P (3) 7P-10P (2)	6A-9A (2) 9A-3P (1) 3P-5P (2) 5P-11P (3) 11P-1A (2)	7P-9P (1)

MONTH: NOVEMBER, 1958

All Times in E. S. T.

EASTERN USA TO:	*6/10 METERS	15 METERS	20 METERS	40/80* METERS
Western Europe	9A-11A (2)* 6A-10A (3) 10A-2P (4) 2P-5P (2)	6A-12N (3) 12N-5P (4) 5P-8P (3) 8P-10P (2)	6A-3P (3) 3P-8P (4) 8P-3A (3) 3A-6A (2)	5P-7P (3) 7P-4A (4) 7P-3A (2)**
Central Europe	8A-10A (1)* 6A-8A (2) 8A-11A (3) 11A-2P (2)	5A-10A (2) 10A-1P (3) 1P-4P (2) 4P-6P (1)	12M-5A (1) 5A-7A (3) 7A-11A (2) 11A-6P (3) 6P-12M (2)	5P-7P (2) 7P-1A (3) 9P-11P (1)**
Eastern Europe (USSR)	7A-11A (2)	7A-9A (2) 9A-11A (3) 11A-2P (2)	2P-9P (2) 9P-12M (3) 12M-8A (1)	6P-12M (1)
Scandanavia & North Europe	8A-12N (1)* 6A-8A (2) 8A-12N (3) 12N-2P (2)	5A-8A (2) 8A-2P (3) 2P-4P (2) 4P-6P (1)	3A-7A (2) 7A-11A (1) 11A-3P (3) 3P-6P (2)	5P-9P (1)
Mediterranean West	8A-12N (1)* 6A-8A (2) 8A-12N (4) 12N-2P (3) 2P-5P (2)	5A-11A (3) 11A-2P (4) 2P-4P (3) 4P-7P (2)	3A-8A (3) 8A-2P (2) 2P-7P (4) 7P-11P (3) 11P-3A (2)	6P-3A (3) 9P-2A (2)**
Mediterranean East	8A-10A (1)* 7A-11A (3) 11A-2P (2)	6A-8A (3) 8A-11A (2) 11A-2P (3) 2P-4P (2) 4P-6P (1)	3A-8A (2) 8A-2P (1) 2P-7P (3) 7P-11P (2) 11P-3A (1)	6P-1A (1)
West Africa	8A-11A (1)* 7A-11A (2) 11A-1P (3) 1P-4P (2) 4P-6P (1)	5A-12N (2) 12N-4P (3) 4P-7P (4) 7P-9P (2)	5A-8A (2) 8A-1P (1) 1P-5P (2) 5P-9P (3) 9P-5A (2)	6P-2A (2) 9P-1A (1)**
East Africa	8A-1A (1)* 7A-9A (1) 9A-11A (3) 11A-2P (2)	6A-10A (1) 10A-12N (2) 12N-3P (3) 3P-5P (2)	11A-2P (1) 2P-4P (2) 4P-6P (3) 6P-11P (2) 11P-1A (1)	6P-9P (1)
Central & South Africa	10A-2P (1)* 6A-11A (2) 11A-2P (4) 2P-6P (3) 6P-8P (2)	5A-10A (1) 10A-12N (2) 12N-6P (3) 5P-10P (2)	11A-1P (1) 1P-7P (2) 7P-10P (3) 10P-4A (2) 7A-9A (2)	9P-1A (1)
South America, Northern Area	9A-11A (2)* 2P-6P (1) 7A-3P (4) 3P-6P (3) 6P-8P (2)	5A-8A (3) 8A-1P (2) 1P-7P (4) 7P-9P (3) 9P-12M (2)	5A-7A (3) 7A-1P (1) 1P-3P (2) 3P-1A (4) 1A-5A (2)	7P-6A (3) 9P-4A (1)**
Argentina, Chile, etc.	9A-12N (2)** 3P-6P (1)* 7A-1P (2) 1P-5P (3) 5P-9P (2)	6A-2P (2) 2P-9P (3) 9P-12M (2)	5A-8A (2) 8A-3P (1) 3P-9P (3) 9P-5A (2)	7P-4A (2) 8P-10P (1)** 2A-4A (1)**
India & Pakistan & Central Asia	7A-9A (1) 6P-9P (1)	7A-8A (1) 8A-10A (2) 10A-11A (1) 5P-9P (2)	7A-9A (2) 9A-1P (1) 7P-12M (2)	Nil
Malaya and Southeast Asia	11A-3P (2) 3P-6P (1)	7A-9A (2) 9A-4P (1) 4P-7P (2) 7P-9P (1)	5A-9A (2) 5P-12M (2)	Nil
Philippine Is. & East Indies	7A-10A (1) 5P-7P (2)	7A-10A (1) 5P-9P (2)	6A-8A (1) 5P-8P (1) 8P-2A (2)	Nil
Japan & Far East	4P-7P (3)	6A-9A (2) 4P-6P (2) 6P-8P (3) 8P-10P (2)	5P-8P (1) 8P-1A (2) 1A-8A (3) 8A-10A (2)	2A-8A (1)
Australasia	4P-7P (1)* 9A-12N (2) 12N-5P (1) 5P-8P (3) 8P-11P (2)	9A-12N (2) 12N-5P (1) 5P-10P (3) 10P-1A (2)	12N-9P (1) 9P-1A (2) 1A-8A (3) 8A-12N (2)	4A-8A (2) 5A-7A (1)**
Guam & Pacific	4P-6P (1)* 9A-11A (1) 4P-8P (3)	8A-11A (2) 4P-6P (2) 6P-9P (3) 9P-11P (2)	7P-10P (2) 10P-3A (3) 3A-8A (2)	10P-1A (1)
Hawaii	1P-5P (1)* 12N-2P (2) 2P-6P (4) 6P-9P (3)	11A-5P (2) 5P-9P (4) 9P-10P (3) 10P-1A (2)	11A-1P (2) 1P-5P (1) 5P-7P (2) 7P-10P (4) 10P-3A (3)	12M-7A (3) 1A-6A (2)**

PROPAGATION

by GEORGE JACOBS, W3ASK
607 Beacon Road, Silver Spring, Md.

(This month's column is devoted to a special [fo]recast for the CW Section of the CQ World-[Wi]de DX Contest which begins at 0200 GMT [o]n November 29th and runs until 0200 GMT [D]ecember 1.

Providing no sudden radio storms develop [du]ring the Contest period (see "last minute [fo]recast") world-wide DX during the daylight [an]d early evening hours are expected to be [ex]cellent on *10-meters*. Excellent DX propa-[ga]tion conditions are also forecast for the *15-[me]ter* band from dawn until well into the evening hours. *Twenty-meters* is expected to open to one part of the world or another almost around the clock, with the band peaking during the late afternoon and evening hours, and again at sunrise. With the approach of winter, DX propagation conditions improve on *40 and 80-meters*. Fairly good openings to many areas of the world are forecast for *40-meters* between the hours of early evening and dawn. Some DX on *80-meters* should also be possible during the night hours, but signals may be weak and the band noisy. In areas where static levels are low, some DX openings may be possible on *160-meters* during the hours of darkness. All in all, conditions this year are expected to be just about as good as they were during the record breaking Contest of last year, with DX conditions best on *10 and 15- meters* during the daylight hours and on *20*, and to some extent *40-meters*, during the night time hours.

[illegible]

[illegible]

[illegible]	10 METERS	15 METERS	20 METERS	40/80 METERS
[illegible] Area	[illegible] 6A-1P (2) [illegible] 6P-8P (2)	6A-3P (3) 3P-6P (4) [illegible] 8P-6P (3)	3P-6P (3) 6P-8P (4) [illegible] 10P-3P (2)	9P-3A (3) 8P-2A (2)**
Argentina, Chile, etc.	[illegible] 8A-12N (3) [illegible] 4P-6P (3)	[illegible] 8A-4P (3) [illegible] 7P-10P (3) [illegible]	[illegible] 6P-8P (3) [illegible] 3A-6A (1)	[illegible] 10P-3A (1)**
[illegible] & [illegible]	4P-7P (3)	3P-6P (3) 6P-9P (2)	7A-9A (3) 9A-3P 3P-6P (2) [illegible]	2A-6A (1)
[illegible] Is. & [illegible]	3P-6P (1)* 8A-10A (3) 3P-7P (3) 7P-10P (1)	8A-3P (3) 3P-6P (4) 6P-12M (3) 12M-4A (1)	6P-10P (4) 10P-4A (2) 4A-9A (3) 9A-[illegible]	4A-6A (1)
Middle & Near East Asia	[illegible] 3P-6P (3)	[illegible] 12N-3P (3) [illegible]	[illegible] 7A-10A (3) [illegible]	[illegible]
Hong Kong, China & [illegible]	3P-5P (1)* 3P-8P (3)	3P-6P (3) 6P-3P (3) 10P-[illegible] (2) [illegible]	12M-7A (2) 7A-9A (3) 2A-7P [illegible]	3A-6A (2)
Japan, Korea & [illegible]	[illegible] 1P-4P (3) [illegible]	[illegible] 6P-11P (3) [illegible]	[illegible] 7A-12N (2) [illegible]	[illegible] 12M-5A (1)**
Australasia	2P-6P (1)* 8A-2P (3) 2P-6P (4) 6P-10P (3) 10P-12M [illegible]	7A-12N (3) 12N-6P (1) 6P-10P (3) 10P-3A (2)	7A-10A (3) 10A-6P (1) 6P-2A (3) 2A-7A (2)	2A-6A (3) 6A-8A (2) 3A-6A (3)**
[illegible] & New [illegible]	[illegible] 4A-1P (3) 1P-6P (2) 6P-9P (3) [illegible]	[illegible] 12N-4P (2) 4P-10P (3) 10P-12M (2)	[illegible] 10A-7P (1) 7P-12M (3) 12M-7A (2)	[illegible] 2A-6A [illegible]
Guam & Pacific Is.	2P-5P (2)* 12N-2P (2) 2P-6P (3) 6P-9P (2)	8A-12N (2) 12N-2P (3) 2P-6P (2) 6P-12M (3) 12M-8A (2)	7A-12N (3) 12N-7P (1) 7P-11P (3) 11P-7A (2)	12M-4A (3) 2A-7A (2)**
[illegible] & [illegible]	[illegible] 12N-2P (3) 2P-7P (4) 7P-10P (2)	[illegible] 11A-5P (3) 5P-8P (4) 8P-10P (2) 10P-12M (1)	[illegible] 12N-6P (2) 6P-9P (4) 9P-11P (3) 11P-3A (2)	[illegible] 11P-7A (2)**

SYMBOLS FOR NUMBER OF DAYS CIRCUIT PREDICTED TO OPEN:

(1) 1-4 days (2) 5-11 days (3) 12-18 days (4) 19-26 days (5) over 26 days

** [illegible]ates time of possible 80-meter openings.

* Indicates time of possible six-meter openings.

[illegible] through December 15, 1958.

Six Meters

While not part of the Contest, it is of interest to note that good world-wide DX is forecast for the *6-meter* band during November. The band is expected to open quite regularly on the trans- continental, trans-Atlantic, and trans-Pacific paths, as well as occasionally to South America and Africa. Conditions are expected to be almost as good as last year with excellent possibilities for WAC. Since the present sunspot cycle is believed to be declining in intensity this may be the last year for many years to come that world-wide *6-meter* DX may be possible.

Solar Cycle Progress

After dropping slightly for two months in a row, the present solar cycle has surged upwards again to reach a *new record breaking peak* in intensity. The Swiss Federal Solar Observatory reports a monthly sunspot number of 204 centered on July, 1958. This results in a 12-month running smoothed sunspot number of 200 centered on February, 1958. This slightly exceeds the previous record of 199.5 established during November of last year. A smoothed sunspot number of 156 is now forecast for November, 1958.

Good luck during the CW Period of the Contest. Any comments readers of this column may have concerning the accuracy of these forecasts during the Contest periods would be appreciated.

73, George

VHF

by SAM HARRIS, W1

P.O. Box 2502, Medfield, M

50mc. 144mc. 220mc. 420mc. and above

Now that the contests are over, the antennas all up, six meters open for DX again and two meter aurora back in full swing, I guess it's time to start nagging again. It is not too late to double the size of your antenna for the winter months. Remember: If your antenna hasn't blown down in the last year, it just isn't big enough. If you aren't hearing those weak signals better than your neighbor, it isn't because his receiver is good. It's because yours isn't. The boys who claim that a better noise figure doesn't make the weak signals any easier to read are generally the ones who don't think it's worth the trouble to change that chewing gum feeling to something with low enough loss to let the poor receiver see what the antenna sounds like. A three db pad between your transmitter and your antenna may make your vswr look good, but it sure soaks up those weak ones. For example: if you have a receiver with a three db noise figure (fair on 2 meters) and 100 feet of RG8U, your system will end up with a 6 db noise figure. This is about equivalent to what you might expect with a real poorly front end and a decent feedline. Or about average for two meter equipment a decade (ten years) ago. Now if you decide to shoot the works and put in a 416B pre amp, you might get your receiver noise figure down to 2 db (conservative). With the same feedline your system NF will drop to a resounding 5.0 db. Changing your feedline to something with 1 db loss per hundred feet would drop your system NF to 3.1 db and you could save your 416B for a rainy day. I am not selling feedline, but if you are in the mood to improve your station you ought to look up someone who is.

Parametric Amplifiers

So if you haven't seen it yet you should look through this issue till you find an article on how to build your own parametric amplifier. Don't let the grass grow while you make up your mind. This is the hottest thing since the maser. And this *YOU* can build. One of the fringe benefits of the varactor amplifier is it's ability to accept the strong signals without overloading or cross modulation. This means that while you might not need the imprc ment in noise figure, on six meters you can benefit in overall performance with varactor. In case you are going to ask w happened to the "up converter" I can only s wait. The people who should know the answ say that the "up converter" is much be than the straight parametric amplifier. Pres 'up converters" are reminiscent of some Rube Goldberg's best efforts. (They do w pretty good though.)

Future plans include amplifiers for both and 432 mc. Construction details for the mc amplifier will be completed for next mor When the 432 mc job is done we will tak shot at the "up converter" for use on t meters. (No promises on this one.)

Contest Results

Somewhere around here you will find results for the August contest. If you did get your log in the mail by the 15th of S tember, you just missed the boat.

Two Letter Technicians

Some time ago reference was made to t fact that W1FY, Ray Stevens, was the o two-letter technician in the country. Boy! D we make a boo-boo! And did we hear about But not from the boys who hold such ca from their many friends. Because of this f there are probably a great many two-lett technicians of whom we still know nothir However, below are a few calls, names a facts concerning the ones of whom we ha heard.

First, another W1: W1AU—Ralph Mathe son, Milton, Massachusetts. Ralph got his fi license on October 1, 1919, on the first d that the "World War I" ban on "wireless" w lifted, and he drew the call of 1 AP, issu by the Department of Commerce. Due to f time work in radio, Ralph allowed the licen to lapse in the mid-twenties. Although n active, Ralph continued his interest in ha radio and last fall applied for a two-letter tec nician call as he had previously held such call. On December 16, 1957, Ralph was issu

he call of W1AU and has been active on six meters ever since.

Number two, a K4: K4BZ—E. E. (Al) Young, Miami, Florida. Back in 1928 and '29 Al held the call of W4NM in Miami and he helped to organize the "Miami Amateur Radio Club" and was an officer of same. The club held the first ARRL convention in South Florida. Al drifted away from the "art" and of course lost his call. When he became disabled a few years ago, Al came back to the fold and applied for a two-letter call because of previously holding one. He received the call of K4BZ.

Next in line, #3: W5GL (/6), Ted Lang, Victorville, California. Ted's original call was 5GL and he was located at that time at El Paso, Texas. He doesn't say just when he received this call but does say that after an absence of twenty-eight years from ham radio he again became interested and received the call of W5GL. Ted's home QTH is located on top of an 1100 foot elevation just north of San Antonio, Texas, which puts him about 600 feet above the surrounding terrain. At present he is /6 at George Air Force Base in California.

Next, #4: W. H. Ritter—K6IP, Banning, California. Bill's (?) first station and operator licenses were issued to him in 1916 by the Department of Commerce, Bureau of Navigation, Radio Service, Radio Station #12403, call 9NS. His station was in Kansas City, Kansas, at that time and the closest radio inspector was in Cleveland, Ohio. Bill still has the second operator license issued to him (which is marked "Renewal") dated January 15, 1917, and sent to him by J. F. Dillon, Radio Inspector, Chicago, Illinois. The number on this operator license is 1466.

Not too long ago Al was "re-infected," bought a new hand book and joined the "San Górgonio Pass Radio Club." He discovered that he couldn't get a Novice license so passed one for Technician and was issued the call of K6IP.

#5: W8RB5 — Al Miller, Olmsted Falls, Ohio. We've been unable to glean any information about Al, but take it for granted that he too had a ticket a lo-ong time ago and was therefore rewarded with a two-letter technician call.

#6: W9BO — Paul Mangus, South Bend, Indiana. After many years of inactivity, Paul took the technician's test and received his old call of W9BO. He was a lucky one. Paul is a member of the transmitter engineering staff of WSBT-TV.

Results of Smokepuff III a la K5IQL

"Operation Smokepuff" is the label given to a series of experiments aimed at bouncing signals off an artificial ionized cloud. The chemicals are carried up into the E-layer region by Aerobee and Nike Cajun rockets and exploded.

Several more or less unsuccessful tests were conducted, with the help of amateurs throughout the Southwest. Finally, after the manufacturers had learned to make the Chemical X, without exploding, a system of beacon signals was worked out; and "Smokepuff III" was scheduled in May.

W7FGG, in Tucson, was selected to beam a signal on 50.010 across the area from the West. W5SFW beamed his signal on 50.400 from the east. Other amateurs listened with calibrated receivers on these frequencies. Jerry, W7FGG, also transmitted on a frequency of 144.010.

The first shot was pulled off at 0240 M.S.T. on May 20. We had receivers monitoring 50 and 144. Immediately upon release of the cloud, the 50 mc signal from W7FGG came booming in S9. It slowly tapered off for more than one minute, when it went down into the noise. From then on for about eight minutes short bursts were copied.

Man had succeeded in bouncing signals off an artificial cloud!

A good photo of Bigelow Green's (W1EHE) home-made "Halo." Have you built yours?

The next shot was scheduled at 0433 on May 21, to catch the sun's rays at the high altitude.

We picked up Jerry's signal on forward scatter as soon as he began transmitting (distance 390 miles). Two short, loud bursts were recorded on this test. One at X plus 85 to 90 seconds, from the rocket itself or a meteorite, and one at X plus 115 to 125 seconds as the cloud was released.

The cloud was released much too high on this test, pointing up the unpredictable performance of the Nike Cajun: and demonstrating our lack of accurate altitude-measuring equipment at heights above 30 miles.

The third shot, at 0434 on May 22, was a calibrating shot. It featured the usual luminescence and spectacular flight, but no ionizing chemical. Its purpose was to learn whether the previous results were due to the chemical. They were.

We again received W7FGG via the scatter route but no bursts were recorded.

Another series of daytime tests are scheduled for September. Beacon stations will transmit on phone for this test.

Newcastle Upon Tyne, England

The following letter was received from Gordon, G4LX, and we hope that it is in print in time to do some good for Gordon and 50 mc contacts.

"Just a line to say that I have a permit to operate on 52.5 mc until October 31, 195 Hope the 50 mc band opens up in time f QSO's with the states! 28 mc is just opening u to W/VE, so perhaps by mid-October, we sha find 50 mc open."

"I shall use *CW only* on 52.5 mc, but wi look for replies on both phone and CW."

"There is very little 50 mc activity in Europ this summer. Sporadic E openings have bee many, and also several aurora openings, bu all I've worked have been HB9BZ, HB9QQ an OH2HK (51 mc). I am running skeds wit ZE2JV at 1700 GMT daily."

"According to my log, the 50 mc pat opened up to my location on October 26, 195 —if propogation conditions repeat this yea there won't be many days for you to wor me on 52.5 mc." *Thanks very much for th information Gordon, surely hope we make on 50 mc this year.—Helen*

Lynn, K4KLC, hard at work talking to W1FMK (Vermont) his only New England State.

Houston is Tops

For some time now we've been receivin requests for C.C.C. both for six meters an for two meters. It suddenly dawned on me th other day that Houston, Texas seemed to b well-represented by requests for the certificate On checking back into the applications I foun that we've received requests from twelve dif ferent stations in the state of Texas for th Certificate. Five of these applications wer from Houston, Texas, the others from as sorted cities in that grand state. Of the fiv from Houston, four of the requests were from Jack Bayha, K5OQN, who at the present tim is the only recipient of FOUR C.C.C. for si meters, (since the middle of March).

Jack (ex-W8BPY) got on six meters o March 15th, 1958 and as he says "I hit it wit both barrels, a Gonset III and a five elemen beam." He has since changed to an eight ele ment beam but is still using that same hig power, six watts. Now let's hear the comment about "the high power boys."

All of the contacts were made in Jack' spare time. He works five days a week, from 7:30 to 5:15 as a research engineer with South western Industrial Electronics. Also, his QSL' were listed, sent to us to be checked, and th lists were notorized besides being signed b another licensed amateur.

Congratulations Jack and Houston, for wonderful job on six meters. Maybe you ough to write an article about "How to get QSL's."

Clubs and Certificates

Speaking of Texas————"The Si Meter Club of San Antonio" was formed las March. This past July it was decided to issu a certificate called "WASA" or "Worked A San Antonio." Anyone wishing to get thi certificate (outside Bexar County) must mee the following requirements: 1. Contact mu

e made with any five members of the club
tter July 11, 1958. 2. QSL's from club
embers should be sent to P.O. Box 82, San
ntonio, Texas requesting WASA. There are
the present time about twenty-five club members.

51.30

Another net formed in our own state of Massachusetts is called the "51.30 Club." You uessed it; the idea being to create more interest in the six meter band above 51.0 mc. t the present time there are about twenty embers in this group all living in the Framngham, Wellesley, Sudbury and Westboro rea. The certificate issued by this group is arned by working ten members of the group t a frequency of 51 mc or above.

Oklahoma

The "Oklahoma Central Six Meter Net" eally has a large number of members; more han seventy, and once again—to receive heir certificate you must work six members f the net, QSL, and send your list to LEE, Box 7171, Oklahoma City, Oklahoma.

Pennsylvania

The "Society for the Preservation of Amateur Radio's Kindred Spirit" on 50 mc is a new six meter club, located near Pittsburgh, Pennsylvania, whose purpose is to assist and ncourage amateurs to make use of six meters. The Club offers free technical advice and assistance to those experiencing difficulties on ix. Schematics and full construction information for simple equipment, mobile or fixed, is vailable free of charge.

The Club uses a calling frequency of 50.2 mc and invites certificate seekers to make use f this frequency in obtaining a "SPARKS" ertificate and membership. Crystals for 50.2 mc are also available at nominal rates. For other information write to: SPARKS, C/O Box 300, East Pittsburgh, Pennsylvania.

Phoenix, Arizona George (W7DIQ) gives us ome activity news concerning the PVHFRC:

"Recent activities include a transmitter hunt which nded with most participants scratching their heads in ront of an innocent looking orange grove. Cries of 'Foul' ubsided at a post-mortem gathering at W7DIQ's QTH where tranquilizers in the form of charcoal grilled amburgers and various and sundry liquid refreshments ere served."

"The PVHFRC has at long last succeeded in becoming ncorporated, credit goes to those tireless former officers nd current members, without whose constant nagging he job would have been dropped. A development made ossible by the recently issued club call, K7DAW, is he association with the MARS organization."

"Two meters is not so populous as six meters but ith W7VMP and W7RUX poking out kw signals on wo meters, Phoenix is well represented." *Thanks for a t of fine information George, keep it coming.*

Landisville, New Jersey Wallace Cantoni (W2HVW) sends a log of his activity for the ast month:

"7/30 58 CO2XZ and K4UDV, 8/1/58 W9PAQ/8 and K8BYA, 8/7/58 K0CAB, 8/8/58 K0LMQ and K0JNH, 8 10 58 W3DHQ/8, 8/22/58 K5AWT/4 and K4LZW, 8 24 58 W0HVW, 8/30 58 K4ETA, 8/31/58 K5EAR. Heard CO2JV but could not raise him on 7/30/58. Used a Gonset III and a three element beam to work the foregoing stations." *Thanks Wally, nice to know what's going on in New Jersey.*

Elkins, West Virginia One of our "8" friends A. E. Minke (K8AXU) sez:

"Just want you to know that I now have 18 states on 2 meters, but I can't seem to work anybody to the south or southeast. I will be operating from my 4000 foot QTH until the weather gets too cold, so tell the boys to look for me when the band is open. Frequency is 144,170 and 144,600." *The boys have been told, hope you have better luck next opening.*

San Antonio, Texas News of openings from Hank (K5HYF):

"The band has been open almost daily to 4's, 6's, 8's, 9's and 0's, with very regular and frequent openings to Phoenix, Arizona. (Written 8/28/58) Quite recently, yours truly, K5HYF and K5MZH worked a real rare one, (or someone has a real rare sense of humor) in the person of HH2PL on July 27, 1958. Pierre in Port Au Prince, Haiti. In the middle of July we also heard, but could not work, that there yl 'Helen', W1HOY, and another yl in Vermont. But they and some other W1's were so darned busy working 4's that they didn't bother looking for some of the Texas boys who need the 1's and 2's for WAS. *Taint so!! I'm always lookin' for the 5's.—Helen.* Among DX worked and confirmed are LU's, VE1's, ZE2JE, SM6BTT, KH6CNI, ZL7DS. The first ZL contact made outside the 6th call area was made between ZL2DS and myself, K5HYF. Also made a cross-band contact with HK7LX in Columbia." *Congratulations Hank, surely sounds like you've been pushing 'em around.*

Lexington, North Carolina From the south and Ron Fritts, (K4OZW) we hear that:

"I have been on the air on six meters for about six weeks, and have worked twenty-three states and three sections of Canada. All call districts except 3's, 6's and 7's have been heard and worked almost every week, and sometimes for several days straight. In addition, several CO's and a couple of Mexican stations have been heard working nearby 4's."

"As for the state as a whole, six meter activity is really booming, with about 35 stations within ground wave distance of each other here in the Piedmont section. Recent formation of the N.C. Six meter Net should cause six meter activity to continue on the increase." *Thanks Ron, and continued good luck with your DX.*

A good inside antenna, according to Harold Itzel (K2CMG) is 'Senor Greg's Sombrero."

San Francisco 9, California Jack Molinari (K6VXI) inquiries as to where-a-bouts of his C.C.C. for six meters and then continues:

"The rig here is a Gonset Communicator II with a Gonset Linear, WRL vfo, SX-99 with a Filter King Converter and a five element beam. Have worked about 24 states, VE7, KL7, and KH6. Alaska and Hawaii have not QSL'd." *I'm surprsed at Alaska but no one that I know of from this territory has received their Hawaiian QSL.*

"So far the activities have been confined to six, but hope to be on 220 by the end of the year." *See you 220, Jack.*

Washington, Pennsylvania Another net. formation from Harold McConnell (W3UEM

"The Penowva Phone Net" standing for Penn Ohio and West Va., has recently been formed. It is traffic and emergency net, meeting every Tuesday nig at 2000 local time at 50.520. Certificate available working 1 W.Va. station, 3 Pennsylvania stations a 3 Ohio stations.

73, Sam, W1F

Don't Let These Fool You

Herbert Greenberg, W2EEJ
821 Rutgers Road
Franklin Square, N. Y.

Situation 1

There seems to be a local tuning up, at least there is an unmodulated carrier which is in the band and remains with no identification or break. After waiting quite a while for something to happen, you finally give up with unprintable thoughts about the type of amateur which violates the regulations and is thoughtless enough to blatantly clutter up the airwaves.

Actually, there may be no amateur doing this. You are doing it to yourself, if you have a broadcast receiver on for Conelrad purposes. The harmonics of a superheterodyne's oscillator are of sufficient magniture to radiate a strong local signal in the immediate vicinity and depending on the fundamental frequency to which it is tuned, may easily create spurious signals in the amateur bands.

This can easily be checked by slightly tuning the BC receiver. If the unidentified signal changes simultaneously, you have identified the culprit. The cure is to monitor another broadcast station whose reception will not cause interference. Don't QRM yourself!

Situation 2

As you settle yourself down for some pleasant uninterrupted operation, you find that the receiver is acting up peculiarly. The S-meter seems to hang at a high level, and no signals can be heard, or at best a very few which you recognize as locals which normally are loud and clear. A loud roaring noise which blankets all of the bands is killing all reception. You vaguely remember that this has happened before, and when you tried to check the trouble it suddenly disappeared.

If you remembered precisely, it was raining also the last time it happened. Or perhaps snowing. What you've been experiencing is precipitation static. Sometimes it will start with a few "pops", increasing in tempo, and resembling ignition interference, and it may fade in the same manner. This is a common phenomenon and treated in some texts, but seemingly little understood by the average amateur.

Usually there is little that can be done. Even grounded antennas don't seem to be able to separate a signal from static and resistors or RF chokes to provide a drain path to ground do not alleviate the condition to any appreciable extent. Changing to an indoor antenna may help, but at the expense of considerable loss of reception capabilities.

This condition is due to small charges of static electricity which each drop or flake contains and which discharges when it contacts the antenna. Enough voltage can build up across an unterminated feedline in the shack to cause discharges. A rhythmic snapping noise was traced to an unused coax fitting which was arcing at regular intervals during a rain, incidentally not a thunderstorm.

While little can be done to relieve the situation, there is no use in condemning the receiver, or starting to trouble shoot a non-existent defect. Remember that "this too will pass". it always has. ■

New Amateur Equipment

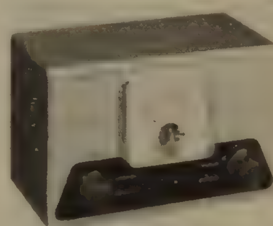
New VHF Converter

RME Division of Electro-Voice has a new converter which tunes 6, 2, and 1¼ ... The output is in the 7 mc band. All you have to do is connect your ...HF antennas to the input and your station receiver to the output. Tune your ... to 7 mc and do all further tuning with the VHF-126. Sensitivity is ... to be excellent. The dial is calibrated in 100 kc divisions. Amateur net ...9. Circle B on page 194 for data sheet.

New Miniature Millen Line

The James Millen Manufacturing Co. has added to their present line of top quality radio components with a completely new set of dials, knobs, couplings, etc., which are only approximately 2/3 the size of the regulator units. These should be of great interest to home constructors who are following the present commercial techniques and are miniaturizing their equipment. One of the great setbacks in compact construction has been the extremely restricted selection of small component parts. Circle C on page 194 for a catalog sheet.

New Heath Kit



The Heath Company has been expanding their ham kit line considerably in the last few months. Their newest addition is a Reflected Power Meter Kit (Model AM-2). This will tell you the SWR from 1:1 up to 6:1 as well as the forward power being transmitted. It will handle well over a kilowatt, will operate from 160 meters through 2 meters, and may be left in the feedline at all times. 50 or 75 ohms input and output impedance. Price $15.95. Circle E on page 194 for catalog.

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1. The names and addresses of the publisher, editor and business manager are: Publisher: Sanford R. Cowan, 6 Embassy Court, Great Neck, N.Y.; Editor: Wayne Green, 300 West 43rd St., New York 36, N.Y.; Managing Editor: none; Business Manager, Richard A. Cowan, 6 Embassy Court, Great Neck, N.Y.

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(Signed) Richard A. Cowan, Business Mgr.

Sworn to and subscribed before me, this 3rd day of September, 1958.

HERBERT PARISER, Notary Public
(commission expires March 30, 1959)

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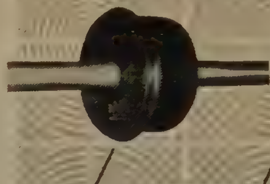
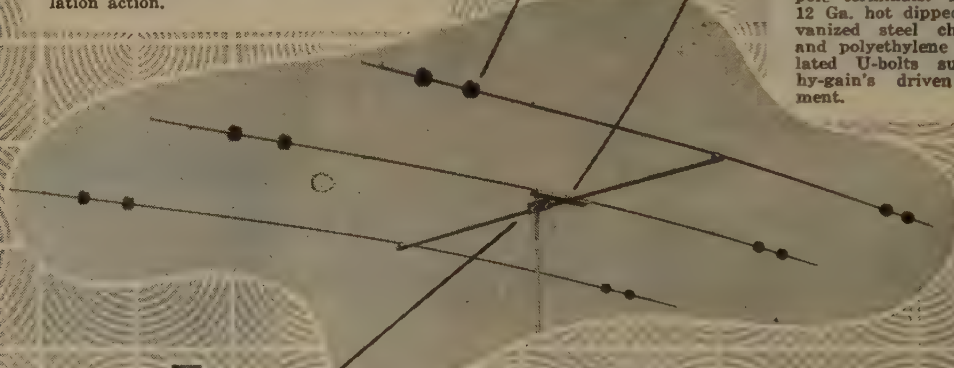
These streamline hy-gain traps are small (3" diameter) and light weight. Capacitor dielectric and coil form molded high impact styron. Each designed to take 1 KW AM, 2000 watts P.E.P. (as much as higher priced tribanders; more than 3-times the power handling capabilities of others. No need to limit your present or future power to 300 watts!) Individually factory resonated for maximum frequency accuracy. Completely weather sealed, water proof and airtight (do not breathe) for years of stable operation. Carbon activated polyethylene covers. Guaranteed for the life of the beam. Hi-Q coils well-removed from any metal mean highest efficiency of isolation action.



Split Insulated Dipole

Split Insulated Dipole Feed with coaxial choke results in SWR of less than 1½:1 on all bands with exceptional bandwidth. No adjustments needed; simply attach 52 ohm feedline to dipole terminals. Heavy 12 Ga. hot dipped galvanized steel channel and polyethylene insulated U-bolts support hy-gain's driven element.



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Practically a featherweight, the 2-Element Mini-Tribander weighs in at only 33.8 lbs. and is easily one-man installed in the shortest possible time . . . and nearly anywhere, with its turning radius of only 12', 11". Boom length 6'. Longest element 27'.

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The 3-Element Mini-Tribander is extremely lightweight, only 39.8 lbs. With a turning radius of 13', 10", this space-saving beam may be installed almost anywhere, yet boasts most of the features of the hy-gain full-sized trap tribanders. Boom length 12'. Longest element 28'.

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For further information, check number 43 on page 194.

For further information, check number 28 on page 194.

BEAMS *[from page 130]*

either side of the element ends.

No factual gain figures can be giver lacked facilities, equipment and time to m such checks. However, this beam seems hold its own with other three-element be in this area. In the 1957 ARRL DX con I claimed 662 contacts in some 57 hours. antennas for 80 and 40 were low dipoles most of the work was done with the interla beam. I'm satisfied—except that I can't w 40 with the beam any more.

One final note may be in order. As a re of my interlaced beams, a number of ha have asked me what I think of them in co parison with the multi-band trap type bea and the multi-band quads. I can't answer questions, as I haven't used the other antenn My interlaced beams have started as the re of having a given amount of booms and a minum tubing and a desire to get increa frequency coverage. For the ham starting fr scratch, the other beams might be better, for those who already have a 14-mc bea the interlaced beam offers the cheapest w of covering other bands.

CONTEST *[from page 107]*

but even if we do not have reciprocal agr ments with ARRL there is no harm in mentio ing it here, everybody knows about the SS.

RSGB

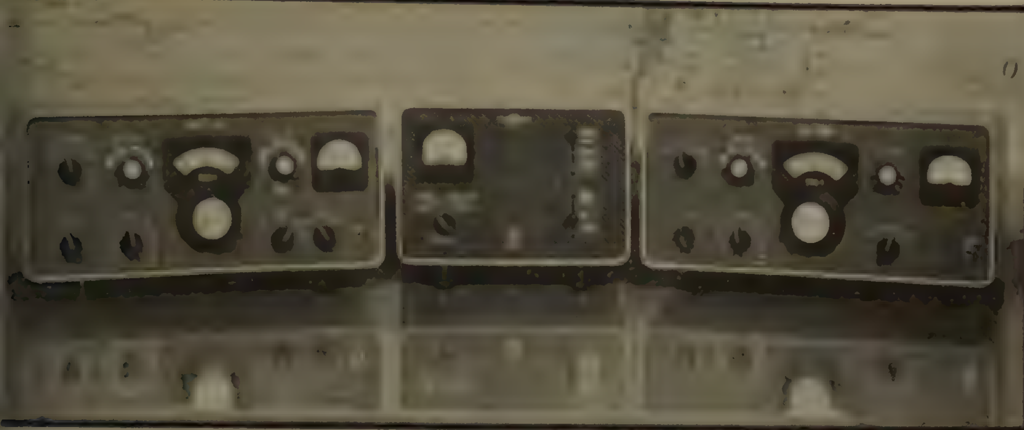
This is a 21/28 mc Phone deal only. Acti ties start at 0700 GMT on Saturday and e at 1900 GMT Sunday. It's the world against British Isles. Last month's calendar had all details. Send your logs to the R.S.G.B. Cont Committee, New Ruskin House, Little Russ St., London W.C. 1, England.

Just as I was writing this column I receiv a call from Bill Leonard, W2SKE, that the C WAS SSB contest had just concluded and t it was a tremendous success. Conditions w excellent and there was plenty of activity b in the U S and abroad. Bill himself made 4 contacts and worked all states except one, missed Nevada. Bob Adams will probably h more to tell you next month in his SSB colun

Remember that contest the Munich g held last fall? Where the first prize for the w ner in each continent was an all expenses pa 3-day stay in Munich on the occasion of 800-year Anniversary Festival. We were kidding. Here's a picture of the boys whoop it up at a local haufbrau. Fritz Hauff, W3GI was the North American winner.

Start those logs rolling in fellows, we w your report no matter how large or small. please don't forget to tabulate your score sure saves us a lot of work.

Good luck and 73, Frank, W1



For further information, check number 30 on page 194.

RTTY [*from page 111*]

Hits and Bits

W6NTK in Fresno, Calif., has a Model and a Model 14TD. W6CQK now has a Ba win electronic organ. QLF? Jack has design a band-pass input filter using those 88 m toroids. W6ITH said he would be on RT from VPØRT and FS7RT. W7RIG repo that he has a few bulletins on Models 28, and 14. K6GVG is now /7 in Laramie, Wy ming. New NCARTS, Inc., members a W6GDO and his XYL K6HHD. W6IWA I a terrific signal on 20 at W2JTP.

KR6AF in Okinawa reports that he is rea for RTTY on 14.1 mc with a 3-curtain rho bic pointed at the States. W9KXZ says th HR2FG has been bitten by the bug. W9JI has a Model 26 which does not unshift space, so please hit that LTRS key, Ge pleads. (See page 89 in the RTTY Handbook W4HKB runs a pair of 6293's in place of t 6146's in his Viking for more power. W7J is constructing a tuning fork tone standard.

H. E. Decker, 1 Queens Ct., Huntington West Virginia, has a limited number of man TM 11-352 on the TG-7-A/B and the TG- B, military Model 15's.

Comments

South America is a much needed conti for WAC-RTTY (which nobody, not ev WØBP, has as yet), but as of September 19 only W6CG has a QSL from a QSO some ti ago. Personally, I saw many Model 15's Venezuela not too long ago. Much of power down there is 60 cps, too. How abo it, YV-amigos? Surely, *one* could be borrow Si?

The Southern California RTTY Society w sponsor another RTTY SS the first week e of November. The contest will be held o a thirty hour period starting at 6:00 PM E Friday, October 31, and ending midnight 12: EST November 1, 1958. Stations will exchan messages consisting of message number, ori inating stations call, check or RST report two or three numbers, ARRL section of ori inator local time (0000-2400 preferred), da and band used. Score one point for a messa received and acknowledged by RTTY. For fi score multiply the total message points by t number of different ARRL sections (see pa 6 QST) worked. Two stations may exchan messages again on a different band for add points, but the section multiplier does not crease when the same station is worked another band. Each foreign country counted ARRL for DXCC credit is treated as a n section for RTTY multiplier credit. Lo should be mailed to Merrill L. Swan, W6AE 372 Warren Way, Arcadia, California.

PS: **Help stamp out Dual Identificatio** (See Comments, Page 86, August 1958 C

73, Byron, W2J

DE BAND [from page 109]

have some definite reports of some of the ading scorers in next month's column.

We also hope to be able to announce definite tes for our Third World Wide SSB DC ontest. There have been hundreds of reests for another one as soon as we can fit into the busy calendar.

K8AEC reports 762 messages were handled aring August by the SSB Net with an aver- e of 43 per station. For more details on is activity we suggest you contact K8AEC.

Membership in the S.S.B. Amateur Radio ssociation is growing rapidly according to e official publication, "The Sidebander." ort, W2KR signed many of the top "Brass" the Armed Services during the ARRL Conention in Washington. Included in the new embers are General LeMay, K4RFA, Genal Griswold, KODWC and General Cook, 4FZ. For information on the association ntact K2CWQ the President or W2PRB, cretary.

We welcome PY1AQT, VU2RM, MP4BBW, A8AC, JT1AA, VP1SD, OK1MB, VS5BY, Q5FS, and a host of other SSB stations to r ranks.

Starting with the next issue we will endeavor present some of the new SB equipment now ailable and to continue to describe other new ar as it is available.

73, Bob, W3SW

CX1000A [from page 94]

ower off. The high voltage negative return to ound is made in the amplifier by the plate rrent meter. A shunting resistor in the power it prevents a 'floating' ground if the meter wiring circuits to it open up. The resistor es not affect the meter accuracy.

Construction

The 10½" x 15¼" front panel is ⅛" uminum, and the chassis are all of #14 gauge uminum. The over-all depth is 15 inches. The ont panel is spaced 3 inches from the front b-panel and the spacing is made with two ½ ch square x 3" aluminum pieces at the top and 3" x 15" x ½" chassis at the base. The front b-panel and the rear panel are identical " x 15" x ½" chassis and are spaced apart elve inches by a pair of ½ inch aluminum gles at the top corners and by a 9 x 12 x 1¼ ch chassis at the bottom. The chassis conining the tube socket and the grid tuning rcuit is 6 x 6 inches and is a four sided box ith the bottom and the side attaching to the ont sub-panel, open.

The baseplate is 12" x 15¼" and covers the ottom of the 9" x 11⅞" chassis and the grid assis. A three sided cover completes the

shielding and acts as a cabinet for the amp fier. A 4½" hole was cut in the top of cover directly over the 4CX1000A, and a 2 hole opposite to the blower intake. These c outs are covered with perforated metal piec

PARTS LIST

L1, L2, L3—2 Turns #26 plastic covered wire, wo on L6, L7, L8.
L4, L5—3 Turns #26 plastic covered wire, wound on L10.
L6—3 Turns #26 enameled wire.
L7—6 Turns #26 enamelled wire.
L8—10 Turns #26 enamelled wire.
L9—½" winding length #26 enamelled wire.
L10—13/16" winding length #26 enamelled wire.
Slug tuned coil forms are all ⅜" diameter. (C bridge Thermionic Co.)
L11—E. F. Johnson Hi-Q Inductor Type 232-626 microhenries).
Coil Taps—29mc—1-2/3 Turns, 21.3mc—2-½ Turns 14.28mc—3-1/3 Turns, 7.25mc—7-1/3 Turns, 3.9mc—11-2/3 Turns.
C1, C3, C16, C17, C18—.002 mfd mica (silver mica ty
C2—100 mfd variable—E. F. Johnson 100 J12.
C4, C5, C6, C7—.005 mfd mica (Postage Stamp Size
C8, C9, C10—.001 mfd ceramic 5KV—Centralab #85
C11, C12—500 mfd 10KV—Centralab TV3-501.
C13—50-1500 mmfd variable—Cardwell Type P1-801
C14—5 mmfd mica.
C15—250 mmfd mica.
C19, C20, C21, C22, C23, C24—.01 mfd disc type cerar
Low Pass Filter—E. F. Johnson #250-20.
Directional Coupler—E. F. Johnson #250-37.

R1—100 ohms 20 watts (Ten, 1000 ohm 2 watt resis in parallel).
R2—100 ohms 2 watts.
R3—10K ohms 10 watts.
R4—4.7K ohms ½ watt.
R5—10K ohms ½ watt.
R6—2.2K ohms 2 watts.
R7—5K ohms potentiometer 2 watts.
R8—100 ohms ½ watts.
Note: The 100 K ohm resistors shown with pilot dicators are part of pilot lamp assembly—E. Johnson #147-1143.
J1—Co-ax BNC Receptacle Amphenol type 31-003.
J2—Co-ax UHF Receptacle Amphenol type 83-1R.
J3—Two contact microphone Receptacle Amphenol PC2F.
J4—8 Terminal Receptacle Cinch-Jones P408 LAB.
P1—Two contact microphone Plug Amphenol 80-MC
RFC 1—2½ Millihenries 100 ma. National R-100.
RFC 2—2½ Millihenries 300 ma. National R-300.
RFC 3—Multiband 800 ma. National R-175A (.225 m
B1—Blower, 60 CFM 115 V 60 cycle motor. Dayton T 1C939.
F1—3 Ampere Fuse & Holder.
M1—0-1 Ampere D.C.
M2—0-1 Milliampere D.C.
M3—0-100 Milliamperes D.C.
M4—VSWR Indicator. E. F. Johnson 250-38.
S1—Wafer switch Single deck 2 pole 6 position, short type.
S2, S3—Toggle switch S.P.S.T. 5 amperes.
S4—Wafer switch, Single deck, 2 pole 2 position.
S5—RF deck switch, heavy duty. Single pole 5 positi Communication Products Co Model 86.

The chassis are all fastened together by m chine screws. The pi-network coil and capa tors as well as the grid coils, grid bandswit and grid tuning capacitor are attached to t front sub-panel. Terminal boards on the su panel facing the front panel enable the amplif to be wired separately from the front panel struments and controls. Connection to t

erminal boards is made from the panel cable. modern look is provided by the new style pen face meters. The front panel and shield over were painted a black crackle to match the eceiver and SB driver which are similarly nished.

The grid to plate feedback capacity of the CX1000A is so small (.02 mmfd) that neuralization was found unnecessary. The tube as a very high Gm and was easy to drive. By he same token it is easy for the tube to self scillate if good design practices are not folowed. The component layout should provide inimum rf lead lengths and sufficient by-passng to a common return ground circuit. Mica apacitors of the heavy lead postage stamp ize should be used for rf by-passing.

The usual precautions of low plate voltage about 1000 volts) should be used when makng the initial tuneup tests.

The plate voltage should be interlocked with he screen voltage so that the tube never has creen voltage without plate voltage. The creen supply line should also include a 0.25 mpere fuse . . . just in case. Adjust the rf rive and loading for the desired plate and creen current. If there is difficulty obtaining he desired current values, the screen voltage ay be varied to obtain it. A "pulser" or an lectronic key locked in the DOT position hould be used to modulate the rf excitation hen making adjustments at full power to prevent excess plate dissipation while the circuit is n off-resonance condition.

Performance

The amplifier performs excellently on all ands. Bandswitching is made simple by a chart sting the input and output capacitor setting f the pi-network for each band. The output meter is a good indicator of resonance, and he grid current meter indicates excessive drive. Modulation is adjusted so that grid current ust begins to show on modulation peaks. It as been determined experimentally by the wo-tone signal input and an oscilloscope that 00% modulation is obtained at this indication f drive.

No flattening of the modulation envelope at 00% modulation was discernible. At 1000 atts indicated power input this linear literally oafs along. The calculated third order harmonic distortion was slightly over three perent using graphical power output versus grid rive ordinates.

With the amplifier operating at full power nput with two tone modulation (using a ummy antenna load) no excessive heating of ny of the rf components was noted after a few ours of operation. Perfection in equipment esign is never attained, but for the present, his linear amplifier looks like a natural for aximum power SSB operation. ■

For further information, check number 34 on page 194.

SURPLUS *[from 115]*

swer every letter too! But again we are force to repeat that all letters cannot be answere by return mail in most cases and any request for air mail returns are out of the questior Most requests are relatively involved and ma take weeks to get a final answer to a problem Tracking down some handbooks or data ma even involve getting in touch with several gov ernment agencies just to determine what th gear is in the first place. Some conversion requested require heap much engineering. S please, please be patient and we promise t continue with reasonable promptness in an swering mail.

Our handbook service seems to be goin great guns, with no complaints to date. If yo are in need of a handbook, we will reques it in your name and you take it from there For instance C. W. Leinger of 1200 Studi Lane, Deerfield, Illinois is looking for th R114/URC-4 book or even a schemati K6GUP wants an APN-4 conversion, whil W3BMR needs the BL-3 book. A letter fror the Southern Tech Radio Club of Chamble Georgia asks for operational information o the T-23/ARC-5 for two-meter use. W1DSV has a BC-1306 and even my handbook source have none so please help. W4BJC got hold o a TS-177 tube tester without a manual.

Ronald Nicholas of 8632 West Boone Stree West Allis 19, Wisconsin and K6JHS both war Mark II, B-19 data. Larry Mindel of 962 Flower Avenue, Silver Spring, Md. is lookin for a complete RAX-2 if he can find one a well as a power supply for a Navy RAK c RAL. K5OGF wants a BC-223-AX handboo while Harvey House, 2022 Bentley Ave. Or lando, Florida wants the BC-652 info.

W3HSL wants ASB data and W9RNL ha to set up an SN or SN-1 radar and needs info W7UVC wants GF-11/RU-16 schematics. Th T-69D/AMT-2 radiosonde book is requeste by W1SGD. Bill Matson, Box 78, 3961st Re con Tech Sqdn, APO-334, San Francisco need the ARR-7 handbook. K2LEO wants DAU info.

Bob Walters, 2425 NE Everett, Portland Oregon needs the DZ-1 and the RT-19/ARC-4 books.

K6CC needs the RMB manual while K5QJI has no way of working on his BC-1333 with out a schematic. W1BWB has a six-mete walkie talkie using an MOPA. Known as th BC-222 it uses type 30 and 38 tubes. He is i need of a manual, the various plugs, contro box, batteries and an antenna. Maybe someon can help him out.

We found out the TBs is available in Hawa at EWA Beach TV and Appliances in Aiea Oahu, T.H. We also have a correction. Th little scope converted during the summer t an indicator monitor should have been liste as the ID-116/APG-15.

73 Ken W2HDM

SUPER *[from page 91]*

Band	Mixer Frequency	Oscillator Frequency
6 meters	50-54 mc	48-52 mc
0 meters	28-29.7 mc	26-27.7 mc
5 meters	21-21.45 mc	19-19.45 mc
0 meters	14-14.35 mc	12-12.35 mc
0 meters	7-7.3 mc	9-9.3 mc
0 meters	3.5-4 mc	5.5-6 mc

TABLE II. Frequencies depend on whether oscillator is above or below mixer frequency, and how much.

Alignment should be done with the receiver in the cabinet, if used, to minimize hand capacity. Small holes in the bottom of the cabinet should be made directly below the trimmer capacitors for easy adjustment.

The i-f stages should be checked because the receiver has been shifted around considerably since the original adjustment. Check by feeding a generator signal to the grid of the first mixer, and realign the 2 mc i-f and the three 85 kc i-f cans. Tune for maximum S-meter reading with minimum signal generator signal output. Starting with six meters, each band is then tuned in this order:

1) Oscillator—some additional juggling of the oscillator may be necessary as outlined previously.

2) Mixer.

3) RF.

Additional oscillator, mixer, and rf coils will be needed if MARS coverage is desired. This one was adjusted to the local 4450 kc MARS net.

Calibrate and make the dial.

Add decals to the front panel to mark the switches. ■

SCRATCHI *[from page 116]*

Next you getting on and calling seek-you fone patch. It not mattering which signal amchoor "C" are heering, your signal or amchoor "B" signal, on acct. amchoor "B" feeding back his reseever over tellyfone line. When getting amchoor "C" you expaneing things, and telling him to finding amchoor "D" by calling seek-you fone patch local. When "C" finding "D" here what are happening.

You (amchoor "A") speeking into both your mike and into tellyfone. Your sigs going out stereo on your freakwency and on freakwency of amchoor "B". Amchoor "C" reseeving freakwency "B" and piping it to amchoor "D" on tellyfone, and amchoor "D" getting freakwency "A" on his reseever direct. Amchoor "D" now getting your sigs stereo.

Of coursely when you wanting amchoor "B" to transmitting stereo, you having to vicey-versey it, and when you wanting amchoor "C" to heering amchoor "B" on stereo, you having to vicey-vicey-versa it. Are you not thinking this are reel slickey skeme, Hon. Ed?

For further information, check number 36 on page 194.

It not taking any extra equipment, and every buddies having more fun than mouse in bra barrel. Won't it be nice, when heering kic yelling and baby crying in background to know ing what direckshun in background they are Hon. Ed., you can even telling what side o mouth other amchoor are talking out of Yours for more Hon. Progress.

Respectively your
Hashafisti Scratchi

RECORDING SATELLITES *[from page 82]*

are quite apparent from the continuous char which might not otherwise be noted when fast chart speed is used. The two evenin passings are approximately the same amplitud and time duration. This indicates that the satel lite first passed east of the receiving locatio and then west of the location. The same hold for the morning passings.

Of particular interest is the amplitude an time duration of the evening passes as com pared to the morning passes. The evenin passes are shorter in time than the mornin passes, indicating that the satellite was on th low side of its orbit and hence its radio lin of sight was much shorter. Its time of passin would thus be short. However, since it wa lower in the sky, its amplitude would be great er than when it was further from earth a in the morning because of the inverse square distance law. This is noticeable in the mornin passes when the satellite was higher in th sky and hence was "visible" for a longer lengt of time. But since it was further away, th signal strength was weaker by the factor of "on over the distance squared." The ratio for Sput nik I was about 560 miles (apogee) over 14 miles (perigee), or 4. This means that when th satellite was furthest from the earth, th power received was 1/16 of that when it wa closest or it was 12 db weaker. (Power varyin with the inverse "square" of distance.)

An item of unusual interest which could b readily noticed by comparing one day with th next was that Sputnik I was appearing abou 7 minutes earlier each day. If it passed at 7:2 PM CST one day, the next day it appeared a 7:15 PM CST and about 7 minutes earlie each day. In this manner it was possible t predict a passing by many days and yet hav it agree within a fraction of a minute of th time as announced by the Smithsonian Astro physical Observatory. This is of particular im portance to Moonwatch teams who must kno when to scan the skies with their "scopes."

The charts also show that the power outpu

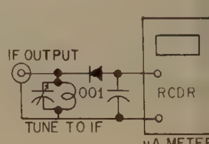


Fig. 5—Circuit for connection of recording meter to receiver.

f Sputnik I (about 1 watt) was almost con-
tant until the transmitter went dead. The last
assing over Texas was noted on October 25,
957, with the signal almost as strong as pre-
ious passes. On the next pass, the transmitter
vas dead—there was complete silence, no
radual fade out.

By noting the charts as to when a satellite
again due, it is possible to set an electric
mer to turn on an audio recorder before
e passing and shut it off after the passing.
his can be entirely unattended operation
hich is especially important if the passing
expected at an hour usually conducive to
leeping!

A slight difference in background or re-
eiver noise can be noted on one day of the
hart compared to the other. This is due to
he fact that the receiver r-f gain control was
urned up on the second day. However, the
elative amplitudes for each day are the same.
he signals appearing on the chart in the
orning and noon hours are due to signals
ithin the pass-band of the receiver coming
ainly from the east when the maximum use-
ble frequency (MUF) was above 40 mc.

Perhaps the reader might be able to sug-
est other uses for slow chart recordings such
s these. At any rate, it is an easy and gen-
rally unattended manner to keep track of the
creasingly interesting and popular earth
atellite vehicles—whatever their shape. ■

Q 170 [*from page 79*]

ntire band-pass to one side or the other from
e nominal 60-kc i-f. For AM the bandpass
moved to both sides of the 60 kc i-f in
qual amounts. The three stages of 60 kc i-f
mplifiers incorporate six high-Q tuned cir-
uits which are capacitively coupled and sep-
rately shielded. High C tuned circuits with the
ddition of ferrite shielding provide long time
ability and freedom from external fields. The
ned circuits are staggered in a multiplicity
combinations which are seectable by means
the selectivity and sideband switch selectors.

Final Comments

The days of push-pull Hi-fi Audio circuits
ith phone-jacks, no less) to receive Ham
ations that are legally limited to 3000 cycles
udio (a long way from hi-fi); of General
overage to help sell to the SWL or the Broad-
st band for the XYL; may indeed be a thing
the past on Ham receivers. It is doubtful
anyone will eventually appreciate this trend
ore than the very Ham who thought he just
d to have these features and has struggled
ith the resultant instability and other un-
sirable compromises of General Coverage
ceivers. While it is true that the MARS mem-
r (I have been one since 1950) and the 20

[*Continued on page 159*]

For further information, check number 89 on page 194.

For further information, check number 40 on page 194.

IQ 170 [from page 157]

ne Sputnik SWL desires coverage of their requencies, it is also true that these are single hannel frequencies and can be obtained very asily on the modern Ham Band Only receiver y adding a very simple one-tube crystal conrolled converter between the antenna and input the receiver. ■

PARAMETRIC [from page 75]

should be possible to tune the pump oscilator through its frequency range without any igns of instability. Leaving the pump adjustents at this setting the tank tuning should e adjusted for maximum signal gain. If osillation occurs, the pump coupling should be urther decreased until the tank can be tuned hrough resonance without any signs of intability.

Now: with the receiver tuned to a signal, he pump frequency should be tuned slowly rom the low side of 2f up. The exact 2f frequency can be determined by identifying the ower sideband signal as it tunes through the ignal frequency. The curve in figure 5 shows he noise figure as a function of pump frequency. Obviously the pump can be varied everal megacycles without appreciably affectng the noise figure of the amplifier. As lower ideband signals are present for all signals in he bandpass of the receiver, it becomes conenient to dump these signals outside the low nd of the band. (I hasten to point out that he present state of the art, as far as I am oncerned, is not sufficiently advanced for me o say that they couldn't be dumped outside he high end.)

The preliminary adjustments having been nade, it is now time to start trimming, pruning nd evaluating. Things to keep in mind are: Maximum gain is not necessarily best noise igure or signal to noise ratio. Any measurement of noise figure should be correlated with signal to noise measurement as well as a ain measurement. In other words, if you can't ear him any better with the amplifier than without, you are not getting the desired results. Wide excursions from the 2f frequency can roduce increases in noise output sometimes vith gain and sometimes without. Depending n your geographical location many spurious ignals can be observed by tuning the pump requency. All of these spurious signals can e explained by using a little arithmetic, some f them might be of sufficient interest to inestigate. A pump frequency of 2f is not necssarily the best. Investigation shows that comarable results can be obtained with a pump f 3f, 5f and 7f. Pumping on 4f and 6f did ot appear to produce usable results. Obviousy if a 7f pump will work, it becomes practical o make a single pump generator for use on

[Continued on page 164]

For further information, check number 42 on page 194.

DX *[from page 118]*

ZL3DA—W, K, VE's QSL to W6ZEN [illegible] Coronado Dr., Oxnard, California. [illegible] stamped return envelope)
ZP5AP—Al Box [illegible] Asuncion, Paraguay
W3ZA/3W—QSL to [illegible] W3JXH 76 Park Ave., New York 2[illegible], N. Y. [illegible] stamped return envelope)
9G1CU—COMCAN, Gifford Camp, Accra, Ghana

is a new one on SSB, now on with 500 watts. Others in zone #11: ZP5MQ, 21200 kc AM, 0230; ZP5AY, 14075 kc CW, 0300; ZP9AY, 14055 kcs CW, 0730.

VQ8AJC says he will remain on Chagos, *Zone #39*, until the end of this year, when he returns to Mauritius, and then possibly another stint from a DX spot—probably Rodriguez Island. Others in zone #39: FB8CH, 14065 kc CW, 1345; FB8ZZ, 14082 kc CW, 1330; FB8XX, 21081 kc CW, 1045; VQ8AG, 14090 kc CW, 1345.

Sorry, but it appears there will be no Jan Mayen, *Zone #40*, activity this winter after all, reports LA4DD. But LA2JE/P, on Hopen Island (Svalbard), now using a new receiver and planning 21 and 28 mc operation, will be there for another year.

73, Don, W4KVX

WEEKLY DX MAGAZINE

If you would like much faster and more comprehensive DX news coverage and articles than space in this column can permit, we suggest you try "DX", the weekly amateur radio news magazine, edited and published by W4KVX. Annual rates, for a minimum of 40 issues, are $5 second class mail, $6 first class, $7.50 via air mail, to the U.S., Canada, and Mexico, and $4 a year plus postage to all other countries. Write W4KVX (address at the head of the DX column) for further details or for a free sample copy. ■

PARAMETRIC *[from page 159]*

420, 220, 144, and 50 mc.

Noise figures measured at the various pum frequencies were about the same. Signal noise measurements indicated that the high order pump frequencies are best. The degr to which the higher order pump frequenc will improve the signal to noise ratio will determined by how well the circuit gets rid the so called "idler" or lower side band sign

The Varactor

If I seem to have slipped over the varact it is because I didn't want to scare you aw before you started. A varactor is a home-ma name for a device the capacity of which vari with applied voltage. There are many varact type devices on the market and available. F

[Continued on page 168]

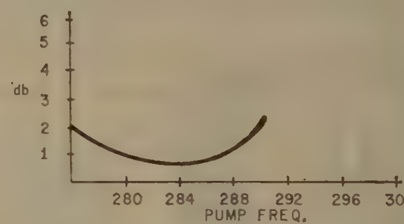


Fig. 5—NF versus Pump frequency for a signal frequency of 144.25 mc.

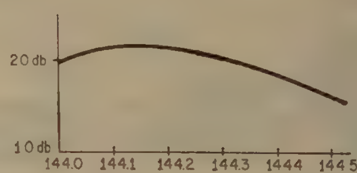


Fig. 6—Gain versus frequency for single tuning of varactor amplifier.

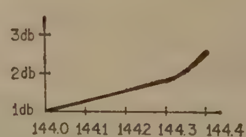


Fig. 7—NF versus frequency or one tuning adjustment of the varactor preamplifier.

PREAMP	NF
6BC4	5 db
417A	2.6db
416B	1.8 db
MA 450	1.0 db

Fig. 8—NF measured with PRD model 904 noise generator. The preamp is followed by a 144 mc converter with a system NF of 5 db.

For further information, check number 52 on page 194.

For further information, check number 53 on page 194.

ırve as a rotating mast. The upper Twin-3 as secured in place on top, again with angle ;ackets, and the second one allowed to find ; position below in accordance with the dis nce allowed by the length of the quarter ave matching sections. Once this position was etermined, of course, the lower boom was acketed to the mast

The phasing and matching lines were of the)0 ohm variety; that is, they were #12 wire paced 6". The length of each was computed om the formula 246 over Fmc.

Phasing them is simple merely keep the ipoles in-phase vertically and out-of-phase orizontally. This means "crossing over" both e top and the bottom quarter-wave sections n one side of the entire array. (See fig. 4)

Since a single Twin-3 of this type would be natched with a 600 ohm feedline. two of them vould match 300 ohms, since they are in paralel. In 1946, twinlead was used. Today—with ndians on the warpath—coax is a wise idea 5 ohm RG11 U into a half wave balun would lso match 300 ohms.

The vertical spacing of the two Twin-3's left omething over four feet of the 4x4 remaining t the bottom, and this was ideal for mounting ith the hinges to the anchor-post of a large ignboard on the roof of the building. One inge, of course, was screwed to the bottom f the 4x4, the other just under the bottom 'win-3.

It was finished. Ready to go up.

The rotation was smooth and majestic—if trifle squeaky.

I moved from there long ago. When I did. didn't have the nerve to try to take my "Birdage" down again. I'd grown older and weaker —and much more cautious. The owner of the uilding must have taken it down about a year ıter, though.

Actually, then, the principle of the stacked 'win-3 is an excellent one. While the mechanial construction was a farce, the electrical inormation contained here is sound, and the an enna is capable of unusual performance. The retically, the gain of such an array would fall the 7 to 8 db range, but, especially at the igher frequencies such as ten meters, its *efective* gain is much better, due to concentraon of the signal at the lower radiation angles.

To be effective, the lower Twin-3 should be least a half-wave above the ground. The ntire array, of course, should be as much in e clear as possible.

As Wayne Green said in one of his editoris, you can never tell what to expect from ıch an antenna. Build it light (by all means!) nd get it up in the air. You may trap a few rds, but you'll be happy with the signal you'll ıt out. ■

For further information, check number 54 on page 194.

For further information, check number 55 on page 194.

PARAMETRIC *[from page 164]*

instance, any semiconductor diode exhibits th capacity change to some extent. Some ceram capacitors do too. If I tell you that there a definite specifications which must be met will defeat the purpose of the article. Thir to remember is: Anything might work. Usab results were obtained on six meters using pulsed up IN21 (M.A. of course). Best resul obtained so far were with a Microwave Asso ciates M.A.-450. (See fig. 5,6,7,8,). Gettin your hands on one of these is difficult at th time of writing but should improve with tim I would say that if you haven't got any resul using something else, you aren't ready for genuine varactor yet.

de W2NSD *[from page 14]*

swatch of red carpet and conducted a briefin for John Huntoon (QST) and myself.

Near as I could figure from everything the said, the story is this: After they had gon to all the trouble to rig up a radar system covering the whole country using the 300 and 10,000 mc radars some spoilsport aske them what they'd do if the incoming plane were to carry radar jamming gear. The an swer to this was simple: use radars on so many different frequencies that no plane could carry that much jamming equipment and still have room left for atom, hydrogen, lithium, or co balt bombs. This project should be finished in a couple of years or so and we will start finding little (?) buzzing noises around some of our VHF bands. Few of the bands will be entirely filled with radar so we should be able to work in and around them in most areas of the country.

In retrospect we are really rather fortunate in that, if everything works out like the Air Force claims, we should experience little if any QRM in most areas of the country and our UHF's will be safe from any other exploitation.

One other little piece of information leaked out: "Scatter" didn't work out as well as expected. This will probably result in a lot less pressure from commercial and military interests for the expropriation of our six meter band.

73, Wayne

SPACE *[from page 72]*

miles per second. With the use of the proposed ion drive, space ships could travel at speeds over 100 miles per second. Thus, logging of exact frequency would have to take into account the direction of movement and the speed of an object, and the frequency change due to doppler shift that this movement caused.

Attenuation of signals with changing distance is another important consideration. An example would be the planet Mars. Its closest

pproach to Earth is 38 million miles, and hat only once or twice a century. Its furthest istance is over 240 million miles. And of ourse, there's our space ship whose distance nay vary from its jumping off point of a few undred to perhaps billions of miles. High owered commercial equipment could no oubt maintain contact, but fading with disance change would be a factor to be comensated for in receiving. Time alone will tell hat equipment improvement will be necessary efore reliable two-way contact will be posible.

Time

One factor, however, that time has very ittle likelihood of changing, is time itself. eldom thought of as a nuisance on Earth is the universal physical constant for the velocity of electro-magnetic radiation (186,272 miles per second). But what a nuisance it will be for space travellers. From New York to Capetown, South Africa, via the ionosphere, is approximately 7900 miles. A ten or twenty meter signal makes the round trip in just under 43 thousandths of a second. Moon-to-Earth contacts are not likely to be bothersome, for only 2.55 seconds would pass before one's carrier went off the air and the return signal was at your antenna ready to be received For Mars the delay for the round-trip would be 6 minutes, 48 seconds at closest approach, and 42 minutes, 5 seconds at its furthest distance Plenty of time here to fill out the log and address the QSL. A QSO with Pluto would be more like exchanging telegrams, for 10 hours, 58 minutes, 24 seconds would pass before you could even hear an answer to your CQ. Unless someone, someday, finds a way of speeding up radio waves, nothing can be done about this time lag. For long distance space contacts the very nature of ham QSO's will have to change Any thoughts of the break-in techniques aplied today are out of the question

The foregoing paragraphs have outlined some of the problems that will confront hams when space travel becomes a reality. In an article of this size not all of the difficulties can be dealt with. If they seem insurmountable, its because we tend to look at them in the light of present day knowledge. But problems have a habit of becoming solved, given enough time and effort. It is with pride that we acknowledge the contributions made by Amateur Radio operators toward the development of the art of radio to its present status. It goes without aying that future hams will make equally important advances, and we will take space-hamming in its stride.

Who will be the first ham to answer a call signing, "This is W8XYZ, operating portable at Base Camp. Earth Expedition One, Syrtis Major, Mars." For that matter, who will be he first ham to make that call? ■

REMOTE CONTROL [*from page 70*]

PARTS LISTS

Control Unit
CH1—Triad C-5X, 12H, 75 ma.
CH2—Triad C-1X, 15H, 20 ma.
CH3—UTC H-24 or A-30
C1, 2, 3, 4—1.0 mfd, 400 vdc
C5, 6—0.5 mfd, 400 vdc
J1—Cinch-Jones S-202-B
J2—Cinch-Jones P-202-B
K1, 2 — Potter-Brumfield KA11A, DPDT, 115 vac
K3—Potter-Brumfield SS5D Sensitive relay
M1—Triplett 420PL, 50 microampere meter
MR1—Conant series 500 or Schauer A4M meter rectifier
R1, 2, 3, 4, 8—Mallory M20MPK, 20k, 4 watt
R5—3.3k, 1 watt
R6, 7—10k, 1 watt
S1, 3 — Switchcraft 3037, DPDT, NO
S2—Western Electric 479JR
S4 — Switchcraft 3037L DPDT, NO
SR1, 2, 3—Federal #1159, 4 each set bridge connected
T1—UTC A25 plate to line transformer
T2—WRL XA-761 plate to line and voice coil
T3 — Triad R-9A power transformer
T4 — Triad A-9J input transformer
T5, 6, 7—Triad F-40X 24 v., 1 a., filament transformer
T8—UTC A-10 line to grid transformer
Relay Units
C1—20 mfd, 450 vdc
C2, 3—1.0 mfd, 400 vdc
D1, 2, 3, 4, 5, 6—1N34A crystal diode
K1, 2, 3, 4, 5, 6—Potte[r-] Brumfield SS5D sensiti[ve] relays
K7A, 7B, 10A, 10B—Potte[r-] Brumfield KA11A, DPD[T] 115 vac
K8 — Advance LE/2C 115VA, DPDT latchin[g] relay
K9, 19, 20, 21, 22—Potte[r-] Brumfield PR7AY, DPS[T] 115 vac
K11, 12—Agastat NE-1[1] 115 vac
K13—Amperite 115C2, second time delay SPS[T] NC
K14—Amperite 115NO2, second time delay SPS[T] NO
K15—Amperite 115 NO30 30 second time dela[y] SPST, NO
K16 — Potter-Brumfiel[d] PR5AY
K17—Coaxial antenna re[-] lay with auxiliary con[-] tacts
K18—Rotary solenoid, 30[°] indexing, 120 ohm co[il]
S1—Mallory 3222J, 2 pole 2 pos., non-shorting
S3, 4, 5, 6—Switchcraft Littel-switch 201
S7 — Switchcraft 3037L DPDT, NO
SR1 — Selenium rectifier 300 ma.
SR2—Federal #1017 selenium rectifier, full-wave bridge 600 ma.
R1, 2—10k, 1 watt
T1, 2 — Filament transformer, 6 v., 1 a.
T3 — Raytheon VR6110 voltage regulating transformer
T4 Filament transformer 6 v., 3 a.

QRG [*from page 32*]

Ham bands by any means, and if you are als[o] an SWL just toss in the proper crystal near the SW band and you will have nice check points on 16, 19, 25, 31, or 49 meters. The accuracy is of course very dependent upon the calibration of these crystals, and a surplus crysta[l] should be checked against a reliable frequency meter.

SW1 is used to remove the 10 kc modulation, thereby permitting quicker and easier location of the frequency of the crystal, whic[h] otherwise would have to be located by it[s] greater amplitude than the adjacent markers.

Oh yes, actual frequency stability of the unit[?] Well—build it up and find out. You won't b[e] sorry, that's for sure. A couple of pointers o[n] insuring stability might be in order. Mechanica[l] stability of the case is important since the cas[e]

is used for shielding the low frequency oscillator coil, and does affect the inductance of the coil somewhat. And the wave shape of the transistor oscillator might be checked to insure that it is a fair sine wave. Excessive distortion here means the transistor is loading the tuned circuit too heavily, although some distortion or clipping must be present to generate the 10 kc harmonics. The crystal oscillator will actually oscillate on as low as 10 volts, but 67.5 volts was used so the battery voltage dropping off slightly with age wouldn't be a problem. Then too, 1R5's also have a tendency to age a bit, and are really fussy with having the correct filament voltage at all times. In soldering the penlite cells in place, be careful about the hole in the center of the top cap, the manufacturer didn't waste time and money putting the hole there for nothing.

After you've assembled the unit, you will probably find it was just as inexpensive as a home built 100 kc crystal oscillator would have been, and twice as much fun. And no more worry about excursions outside the bands. ■

RULES [*from page 53*]

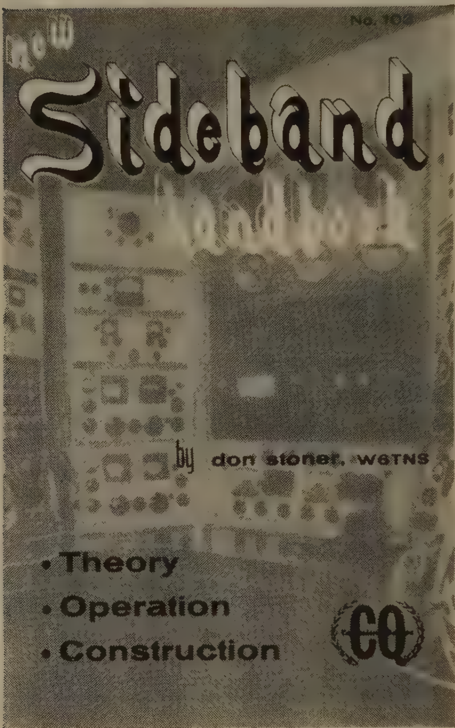
market which will provide for the operating ground. This as a wall outlet[1] which will replace the standard type outlet. In addition to the slots for the two parallel power plug blades, it has a U-shaped opening for a ground wire. Attachment caps[2] and cord sets[3] are available for these outlets, although the standard household plugs can still be used with them. Before installing one of these units, it will be necessaary to determine whether or not the outlet box is grounded. If your house is wired with conduit or flexible metallic cable, it is probably grounded. If the wiring is open-type, however, it is unlikely to be grounded and you will have to provide an additional wire for the ground. With this type of grounding plug the equipment is automatically grounded whenever the power is available to operate, and additional wires for grounds are unnecessary.

In addition, the National Electrical Code requires that all controls be grounded, transmitters shall be enclosed in a metal frame or grille, and all access doors shall be provided with interlocks which will disconnect all voltages in excess of 350 volts when any access door is opened.

These rules are not stringent. They are all common-sense requirements, and many amateur stations, no doubt, now comply with them. Knowledge of the rules and their existence is, nevertheless, a valuable factor in the presentation of the amateur station as a safe and conforming installation. ■

1 Bryant 5242; Hubbell 5252; General Electric 4060
2 Bryant or Hubbell 5263, 5264, 5266; General Electric 4363-5
3 Pacific Electricord 1316, 2316

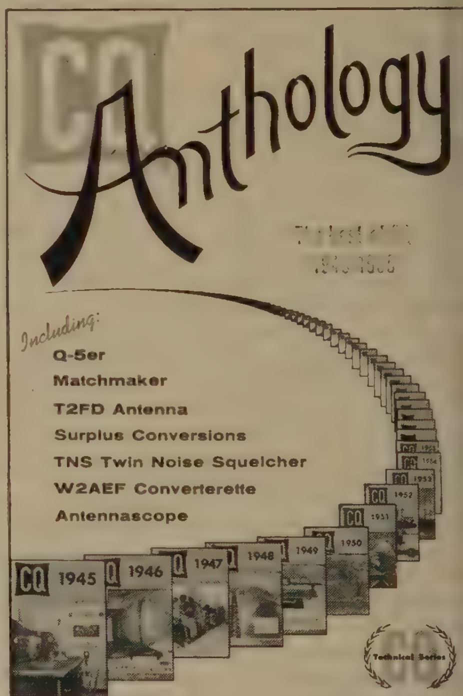
NEW BOOKS!



SIDEBAND HANDBOOK

Well, we've done it again. We've got a brand nev Sideband Handbook on the presses. Everything i this book is new. All of the dozens of constructio articles were written specially for this book. Ther are absolutely NO reprints of any information tha has appeared in CQ or anywhere else. This book i new from cover to cover. Written by Don Stoner W6TNS, Novice and Semiconductor Editor of C as well as author of the best selling Novice & Tech nician Handbook was almost one full year in th preparation of this terrific volume. This is *not* *technical* book. It explains sideband briefly and the spends most of the time on showing you how to ge along with it . . . how to keep your rig workin right . . . how to know when it isn't . . . and lot of how to build-it stuff, gadgets, receiving adaptors exciters, amplifiers . . .

The price? Way out of line, only $3.00 . . . i should be $7.00.



CQ ANTHOLOGY

Down through the years CQ has had the honor of being there first with just about every major discovery in the amateur radio field. Unfortunately most amateurs do not have a good file of back issues of CQ to fall back on when they are interested in building up something or in improving their equipment. So we've looked back through the years 1945-1955 and assembled all in one place the articles that have made a lasting stir. The issues containing most of these articles have long ago been sold out and are unavailable. The price is a paltry $2.00.

CQ MAGAZINE
BOOK DEPT.
300 West 43rd St.,
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C-11

☐ New Sideband Handbook ☐ CQ Anthology

Sirs: I enclose .... Please send the items I have checked above postpaid to:

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CITY ....ZONE ....STATE ....

N.Y. City residents add 3% Sales Tax

(see page 54)

Ye Old Timer

Answers

ease take test *before* reading answers. (ed)

Here are the correct answers

. This is definitely TRUE. "Physics," Housman & Slack 3rd Ed. p 350

. Since there is no scroll work, an amateur license is NOT a federal document and *can* legally be photocopied. See "US Amateur Regulations," 12.25. Answer was FALSE

. Electrons themselves move slowly but their effect travels at the speed of light. Ref: Any physics book. Ans. FALSE

. If the electron was accelerating, the statement would be true. See "Federal Handbook" 4th Ed. p 891

. ½ of 72 = 36 TRUE. Any antenna handbook

. TRUE

. TRUE

. TRUE

. If the current was changing at a rate of 1 ampere per sec it would be true. See "Physics" H&S p 446

. This is a stinker. Most people miss this.

$$Q \text{ series} = \frac{WL}{R}$$

$$Q \text{ parallel} = \frac{R}{WL}$$

Answer FALSE. "Alternating Current Circuits" Kerchner & Corcoran 2nd Ed p 103

. Only persons possessing a valid amateur operator's license may *OPERATE* a properly licensed amateur station. See 'US Amateur Regulations" § 12.28

. This is TRUE. See "US Amateur Regulations" § 12.190

. This will surprise most anyone but, you *CANNOT* legally destroy your own transmitter if you want to. Want proof? See "US Amateur Regulations" § 12.161. Answer FALSE

. There is no such thing as a "Portable Mobile" etc. The regulations do not possess such a term. Answer FALSE

. You boys aren't keeping up with the latest jazz. This used to be legally TRUE but no more WHOOPIE!! See "QST" Nov 57 p 69 Docket #12160 Amends section § 12.90 § 12.91 and § 12.93

. TRUE

. It is TRUE chilluns. See "Physics" H&S p 539

18. Some of yo'all jus' don't read scien fiction. Answer TRUE
19. Were you caught with your pants dow on this one? It happens to be TRUE. S "Transmission Lines & Fields" by Johnse
20. Tricky/// 1. RG58/AU is 53.5Ω not 72
2. it says *electrical* length n physical. Answer FALSE. If it said 53.5 and physical length it would be true.
21. FALSE
22. F.M. is flat. P.M. has an inherent 6 per octave pre-emphasis. Hence wi *complex* audio the signals must be differer See any text on F.M.
23. These are all TRUE. Included to point o the seldom realized advantages of SS P.M., and F.M., over A.M. See "Modul tion Theory" by H. S. Black.

1. They're all in parallel kiddo. 48/4 = $12/2 = 6$ $6/2 = 3$ Answer 3
2. This is a dilly. There are *two* answers. Sin I is common in series circuit

$$I_1 = \frac{P_1}{E_1} = \frac{10}{E_1}$$
$$I_2 = \frac{E_2}{R_2} = \frac{E_2}{10}$$
$$\therefore \frac{10}{E_1} = \frac{E}{10}$$
$$100 = E_1 E_2$$
$$100 = E_1 (25 - E_1)$$
$$100 = 25 E_1 - E_1^2$$
$$E_1^2 - 25 E_1 + 100 = 0$$
$$(E_1 - 20)(E_1 - 5) = 0$$
$$\text{BUT} \quad E_1 + E_2 = 25V \quad \therefore E_2 = 25 - E_1$$
$$E_1 = 20 \qquad E_1 = 5$$
$$I_1 = \frac{10}{20} \qquad I_1 = \frac{10}{5}$$
$$I = .5 \text{ amp} \qquad I_1 = 2 \text{ amp}$$

3. Had you going eh?

$$\frac{x \text{ blips}}{22.5 \text{ sec}} = \frac{x \text{ miles}}{\text{hr}} = \frac{5{,}280 \text{ ft}}{3600 \text{ sec}}$$
$$1 \text{ blip} = \frac{22.5 \text{ sec x } 5{,}280 \text{ ft}}{3600 \text{ sec}} = 330 \text{ ft}$$

4. Lazy "H" remember the early TV rage
5. As the battery charges the charging cu rent diminishes, therefore the appare resistance must have increased. Answer INCREASES
6. Same thing (aren't we devils) Answer DECREASES
7. This separated the men from the boy Correct answer is 4.9V. Did you forg that the 6.3vdc flows through ½ of prima during 1/225 of a second, but the (rms) goes thru a complete cycle in 1/ of a second? See any commercial mobi power supply schematic such as RCA, D Mont, Link, G.E. etc.
8. Leading by 45° or lagging by 315° a text.
9. (a) lose 63% . . . any text
10. (c) 4 times . . . see any ARRL handbo section on Modulation

odulation [*from page 52*]

both ways, and in the more than two years e system has been in operation, have never ceived a report other than of "plate modula on" quality.

The simplicity and ease of adjustment of e system, together with a minimum of modi cation, should recommend it to hams whose ain interest is cw.

As to specifications for the choke—almost ny old filter choke will do. However, if the ductance is much more than 8 Henrys, bassy odulation will result. Also, the choke should e rated for at least 100 ma., to avoid sat ration. ■

ELETHONS [*from page 47*]

andling paper work, answering the telephone aking coffee and attending to a lot of numer us details. Besides, this will instill them with e spirit of ham radio and co-operation. It ill also give them the sense of "belonging" the organization.

Arrangements with a local bank will solve e handling of money collected by the mobile perators. A choice can be given the mobile perator of turning his collection over to the ank personally, or he may drop it off at the ontrol center. In the latter case, adhere to e following procedure. As each operator rives, have him place the receipt book and oney on a table at which two control center ersonnel are seated.

While one man double checks the amount f money collected, the other totals the amount s shown on the receipts. When the two totals oincide, the money and receipt book are laced in an envelope and sealed. The mobile perator's name or call is written on the en elope together with the amount contained herein.

One of the men, or two if you wish, is dele ated to turn the envelopes and contents in to e bank. It may be wise to have a police scort. Otherwise, ask the telethon sponsors to end a man to pick up the collections. Be sure obtain a receipt showing the exact amount elivered to him.

Maybe this whole thing seems like a lot f work, but the resulting publicity is worth . Amateur radio will have been brought to e attention of the general public by television. ewspapers and in person by the mobiles. ■

G-8 [*from page 49*]

Remove 5600 ohm resistor between TD-1 nd G-5, replace it with a 15,000 ohm 1 watt arbon resistor (NS).

Run an insulated lead from G-5 (S) to ter inal 3 of 10,000 ohm section of new control S).

Run an insulated lead from TD-1 (S) terminal 1 of 10,000 ohm section of new co trol (S).

Replace 150 mmfd. condenser between R and TA-2 (on subchassis) with a .005 m disc ceramic (S).

Replace "AF IN-OUT" knob.

Replace signal generator in cabinet.

These changes should take between 15 a 30 minutes, depending upon your persor working speed. The instructions are val whether the 1 megohm section of the poten ometer is on the front or the rear.

Operation of the rf section of the signal ge erator is unchanged by addition of variable pe centage modulation; and the external af outp functions the same as before. When an extern af modulating source is used, available powe for a given source, is very much greater, a variation produced by the "AF IN-OUT" co trol is now exponential, instead of linear (I instead of R, R being the setting ratio).

When internal modulation is used, norm setting of the "AF IN-OUT" knob will be abo 1/3 of the way clockwise from the left sto and 100 percent modulation will be about 2/ of full clockwise rotation. For normal servicin use, no other changes are either necessary desirable.

When the instrument is to be used extensive ly in tropical environments, or in isolated loca tions where the line voltage, frequency, an wave form leave much to be desired, operatic will be improved, and service life extended b the following changes:

1. Replace all ½ watt resistors by 1 watt re sistors.
2. Connect a 10 ohm, 2 watt resistor in serie with the pilot.
3. Replace the 20-20 md. 150 volt filter ca pacitor by a 50-50 mfd. filter capacitor.
4. Connect a 50 mfd. 150 volt electrolytic ca pacitor from TD-1 to ground.

SIDEBAND [*from page 44*]

changed to send us to Kingston and Gran Cayman. We got to Kingston on the 17th, bu Sam, VP5RS, had left for the States on business trip the day before, so were unabl to get on from Jamaica. The next mornin we went over to Grand Cayman. Sparky VP5BH, was at Owen Roberts field waiting fo us. (We had been enabled to get on at Cayma through the kind offices of W8SDD who in formed us that we'd have to get in touch wit Bob, W4OMW, to get permission to operat from Sparky. A quick letter to Bob had gotte the required permission.) Sparky took us dow to the Bayview Hotel, where the O.V.A.R.A gang operated during their celebrated DXpedi tion last year. The Merrens, who own th hotel, also run another hotel, the Pagean

each, and they suggested we take a look at before we decided on an operating site. After iewing the pool, the beach, and other facilities, e decided that the Pageant Beach was for us. 'hil was in Europe on another trip, and Herian wasn't able to come because of sickness n his family. Consequently, Jim and I carried he torch with the help of Sparky. Without the 4-AV, we had to set up dipoles again for 0, 40, and 15, along with a vertical for 20. While the antennas worked all right, again he antenna switching cost us much of the dvantage we had in the easy bandchanging of he HT-32. However, we managed to work over ix-hundred stations between 1600 on the 18th. nd 0900 on the 20th. It was fortunate that ve were able to get on when we did, as Cayman lost its separate country status on June st. We concentrated on SSB again, but worked number of cw stations, also. Sparky is a ormer ship radio operator, and until recently vorked as operator for one of the airlines at Owen Roberts. Naturally, his cw operating left othing to be desired. The O.V.A.R.A. gang ad dispensed great numbers of contacts on w and am last year, and Noel Eaton had given number of the boys Cayman on am a few veeks before we set up, but there was still a ileup most of the time. This was particularly rue on SSB. While we weren't the first station o operate SSB from Cayman, most of the boys till needed it.

Getting away from the ham end of the trip, few minutes after we got set up, in came the wner of the Cayman Yacht Club, Jim Ford, vho is an American from Detroit. A former Navy Commander, he has settled in Cayman, nd runs a ship in addition to Yacht Club. After eeing our efforts, he brought over varied reeshments to keep us going. The next day, he ook us for tours of the islands in shifts to eep the rig on the air. That night, he threw dance for us at the club. All this hospitality hreatened to disrupt the operating schedule, ut Sparky filled in the breech. We managed to et off on the 20th, and got home all right.

The next weekend, we were scheduled for an Juan and Barbados. I had hoped to get to outh Caicos again, but the schedule was hanged again to send us to Kingston and arbados. We spent the night of the 23rd in Kingston. Sam still wasn't back from the tates, so we left the gear in the plane again. However, Sam should be on SSB soon with a ood rig, and everyone who needs Jamaica hould be able to get it without having to fight DXpedition QRM. We arrived in Barbados on he evening of May 24th, and blew a tire on anding. It took several hours to make arrangements to get a replacement tire and tube, and e didn't get set up at VP6LT until 2200. We ad to stay on 15 that night, as it was too ark to put up the 14-AV. The next morning he vertical was put up, and this let us hit

[continued on page 180]

Better Audio-10¢

George Bonadio, W2WLR
320 Winslow St.
Watertown, New York

A small expedient in some ham receivers ca give better audio for almost no effort and fo only the price of one or two small parts.

Simple inverse feedback on the last audi stage of a receiver will dampen the transien responses of the loudspeaker or headphone It will also help flatten out the response curv of the mountains and valleys.

A single resistor of between ½ and 1 meg ohm connected between the audio output plat and the driver stage plate will effect this. Th value should be chosen to effect a substanti drop in gain, but not enough to cut the usabl gain in CW or SB positions.

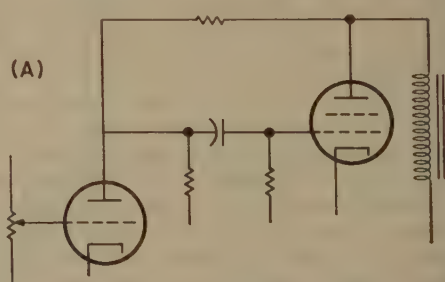
If the receiver circuit is not to be tampere with, then a socket to socket jumper, abov chassis, with insulation taped around the re sistor pigtails can do this fine. The ends ar merely wrapped around the proper tube pin upon tube insertions.

If the gain control is on the last grid, the there is another variation which should b used. The connection should be between th last audio grid and plate, including a serie blocking condenser of not less than .005 mf with the resistor.

One important factor is psychological i that the effects of fatigue from a few predom inant audio frequencies reproduced will b lessened. One may listen longer before becom ing weary of it. Naturally, readability or cop of voice is slightly enhanced. Friends sound more natural this way, too.

For 10¢ or so, better audio is worth having Manufacturers please copy.

(A)



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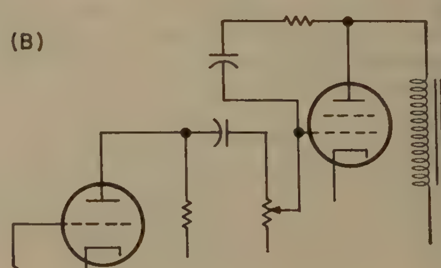

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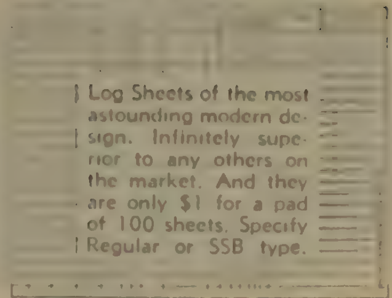

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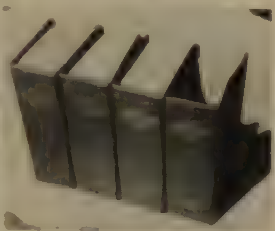

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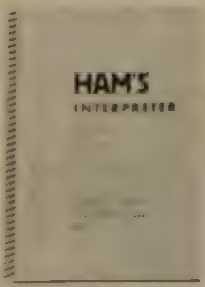

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SIDEBAND [*from page 177*]

several bands. We packed up the gear again on the 26th, with the exception of the 14-AV. Again, we lost the vertical. This time, Mac, VP6WD, a retired British Army officer, who has been a ham since 1922 in New Zealand, decided he couldn't get along without it. We' been using the vertical again against a metal roof for a counterpoise with grand results. After waiting at the plane for several hours, we found the tire was in, but the tube was lost somewhere. So, we went back to the hotel, but left the gear in the plane, as Eric and Claude had a large evening planned for me. The next day, we got it out again, and passed out a number of VP6 SSB contacts again. Eric interceded with the local manager of the airline that was getting the tube for us on the 28th, and we managed to get the tube and get out that evening. I don't think we left Barbados as a barren SSB spot, though. Eric is building an SSB rig, and has been offered a commercial rig for two months so that he can put some of the nearby islands that are new countries on SSB. Mac brought an SSB rig out from England with him. It was damaged in shipping, but he expects to have it on the air soon.

Unfortunately, that was my last SSB DXpedition. I'm being transferred to a desk job in Washington, and won't have the golden opportunity to make the trips that has been afforded me through flying for the Navigation School. I only hope that someone else is as fortunate, and is able to get on from some of these countries, as I haven't worked them on SSB, myself.

Naturally, no DXpedition is complete until the QSL situation is handled. We requested that stamped, self-addressed envelopes be sent with each US card. This not only saves us considerable money on postage, but permits us to handle cards in 35% of the time that is required if we have to address and stamp each card. We started the QSL'ing as a joint project, but decided that in order to meet the multi-operator station rules in the DXCC guide, one man should sign them. Since I went on every trip, I handled it, and am responsible for any errors, and have copies of all logs, if anyone still needs a card. Of course, we received a number of cards without envelopes. These have been aswered, too—after all others. We received only three cards for which we have no record of contacts, which is an amazingly small percentage, based on my earlier experience as DX. As for the cards used, we decided to save the expense of fancy cards, and have used GE cards when available, and 3 x 5 stock cards when those ran out, handling the printing with a duplicator. This has enabled us to start cards out within a day after our return from the trips. If you have worked us, and have

ent a contribution with your envelope, you have had it returned. We aren't allergic to money, but feel that as we were riding in government aircraft, the acceptance of even an IRC beyond postage cost would be a poor policy.

As for the equipment we took, we were pleased with everything but my exciter. The 75A4 performed perfectly all the way through, and it rode a distance equal to a couple of trips around the world in the back end of transport planes, and had a lot of rough handling on the ground, as well as suffering through widely varying line voltages and currents. We were all greatly impressed by the HT-32. I've been building my own transmitters for 24 years, but I've decided that Mr. Halligan has built a rig better than I can build myself, and that I'd be foolish to try to build my own exciters in the future. It'll be tough going back to my own exciter until I can save up enough pennies to get an HT-32! As for the 14-AV, it worked beautifully for us. It has a low swr, and seems to work as well as a good vertical cut for any single band in its range. It won't put out the signal that a good beam will, of course, but it's a great deal easier to set up than any beam, particularly for applications like ours. If I were going out tomorrow, I'd take along just the equipment we took on the last few trips, and I feel that I'd have to go to a great deal more effort and weight to improve operation materially.

We owe a great vote of thanks to the hams who gave us the opportunity to put their countries on SSB. We probably owe a bit more to their womenfolk who put up with us on these trips, and thank them all. The whole operation has been a lot of fun—and hard work. For me, it has meant giving up all other ham activity for several months. However, we have managed to get several of the SSB boys over the DXCC hump, which was the aim of the trips in the first place. Now, I'll look for new ones. ■

TUBE REGEN *[from page 39]*

our use. In fact it can be checked with an absorption type grid dipper and will indicate rectified grid current on the meter. A two turn link takes this energy to a similar tuned circuit near the rf stage tube, and it is coupled into the grid of the triode section of the 6U8. This triode section of the 6U8 rf stage acts as a cathode follower to inject 10,494 kc into the cathode of the pentode section.

Conversion is very good. There is plenty of additional gain added to the set on all bands including 14 megacycles and there are not so many spurious signals. The two tuned circuits that bring the 10,494 kc energy from the oscillator tend to reject other harmonics. The set is just as stable on 14 mc now as it was on

For further information, check number 65 on page 194.

the other two bands.

At first I thought we might have to use a switch to cut out the 10,494 kc injection whe[n] using the rf stage as straight through amplifie[r] on 3.5 and 7 mc. There seems to be nothin[g] gained by this and the injection frequency doe[s] not seem to cause harm. The rf stage wa[s] mounted on a piece of aluminum about inches square and double decked on the chassis, since we seemed to be running out o[f] chassis space.

For the benefit of those who might be interested in using this device to convert to 21 mc this was tried. There did not seem to be enoug[h] energy on the 10th harmonic of the crystal t[o] give output at 17.5 mc to do the conversion It might be accomplished by the use of a 17.[5] mc crystal, but I have an idea that there is considerable reduction in gain at 21 mc tha[n] that obtained on 14 mc. It appears right no[w] that a successful converter to 21 mc (and 2[8] mc) is going to need a good rf stage plus a converter stage and several low-loss circuits to d[o] a creditable job.

NOTE

When making the additions to the diagram several errors were observed. The new schematic is corrected. The errors were:

1. Mixer osc. is a 6K8.
2. Tank condenser of 6K8 triode is 3 mmfd negative coefficient 750 ppm instead of 750 mmf.
3. Pin 3 of the 6U8 *if* and det. connects to plus 250 through a 47K resistor and not to the filament.
4. The resistor in series with the 10K pot in the same stage is .1 meg. instead of meg.
5. The plate load resistor in the plate (pin 1) of the same stage is 47K instead of 4.7K.
6. The cathode of the 6U8 audio triode is returned to ground instead of the control grid.

For those who might think this little set just a toy, I would like to say that it has been used on all three bands under severe conditions of QRM and weak signal reception, and its performance is comparable to best of receivers within the frequency and emission coverage fo[r] which it is designed.

There is a lot that could be said for simplicity. Ever so often we reach a point in complication that we rebel and go back to simple things, and often leave behind some headaches. I have switched back and forth from the big set to the little set on weak Asian signals on 20 meters and on European signals on 3.5 mc and frankly there is not a lot to choose between the two. The big set has 19 tubes, is as big as a house and weighs a ton. Come to think of it, why should the poor received signal have to excite 19 tubes when it can excit[e] 5 tubes?

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For further information, check number 66 on page 194.

HEAT SINKS *[from page 37]*

acid, maybe you can talk a garage out of some battery acid. This stuff runs about 1.260 these days and if you'll mix it with an equal amount of water, you'll be close enough.

We now have the acid in the pot. Toss in a piece of scrap aluminum for the negative electrode. If the XYL was out of town and you used an aluminum pot, then just attach the negative lead to the pan. If you plan to plate a *part* of a chassis or heat sink, just put it in the pot, clip your positive lead to the part that's outside the solution and let it go. If the pot is aluminum, a small piece of glass in the bottom will keep the thing from shorting out. If you are anodizing the whole piece of aluminum then you'll have to be sure that the wire connection is also aluminum, at least until it gets out of the solution. In the case of washers you can force your aluminum connecting wire into one of the holes or you can leave a tab to be clipped off later. Just remember that where the lead connected there will be no insulation.

As for the power supply, we used a dc supply ordinarily used for bench testing car equipment. It seemed to bubble nicely at around ten to twelve volts and drew four or five amps. The simple system would be to just clip on to the car battery. If it bubbles, it's working, but don't get your nose too close. There will be some fumes and maybe a little splashing as the surface bubbles burst. How long to cook it? Good question. Depends on current density and stuff like that. We've tried all the way from 20 minutes up with good results. Before we learned the hard way that the surface *had* to be smooth we kept trying to improve the anodized surface by keeping a piece cooking for several hours. When we took it out, the anodized surface seemed no thicker, the scarred marks were just as distinct as when we put it in, but the aluminum was considerably thinner. Maybe some authority in the audience can explain that one. (Don't write me, write the editor.) (Don't write the editor either . . . Ed.)

As a good rule of thumb, the surface is anodized when it gets a good milky look. Take it out, wash it off—good. Dry it, *thoroughly*. If your luck has held, you now have a chunk of aluminum with a thin insulating surface. This doesn't mean that you should now take the two needle probes of an ohmmeter and dig in and see. At this point don't louse up your surface. If you're dealing with washers, drill corresponding holes in the chassis where you intend to do your mounting, and carefully de-burr this area where the washer will touch. Your washer has two insulating surfaces, but there's no sense in messing up the spare.

Now, carefully check to see that the base of the transistor, the anodized washers and/or chassis are all clean. Place insulating tubing or spaghetti over the studs or mounting screws,

keep them from contacting the washers or
it sink, and slide the transistor down into
ce. Place a fibre washer over the mounting
d or screws and tighten it up. Remember that
transistor base needs to make firm contact
th the anodized surface.

Now, cross your fingers. Check the resistance
tween the chassis and the base of the transis-
on a high resistance ohmmeter. It should
ad well up in the megohms. As a typical
ample, we constructed a transistorized power
pply using two 2N278s, mounted on a com-
on thin aluminum washer 2" by 5" and
amped to a ⅛" aluminum panel. Resistance
easurements from either transistor base to
panel was greater than 100 megohms. Since
external resistance used across this path
ll probably not be over a couple of hundred
ms, this seems adequate. Although it's not a
ctor in this application, the capacity from
se to chassis measured at .005 mfd, an in-
cation of the thinness of the anodized sur-
ce.

This process is simple and nearly foolproof.
eat the acid with respect, exercise a little
re in fabricating the parts to be anodized,
t the battery polarity right, and there's little
at can go wrong.

At this point it might be well to add a word
reminder. In this procedure we have not
minated the heat problem in germanium
ansistors. We have, instead, taken steps to
ansfer as much of the heat out as we can.
is does not mean that we can now bolt our
at sink to the exhaust manifold of the family
vver and talk our way to grandma's house.
r automotive mounting in the great but hot
ate of Texas I prefer to have my transistors
the car with me. Under-the-hood mounting
ay provide good ventilation when the car is in
otion, but on a hot summer day the heat
diated off an asphalt highway plus engine
at makes the advantage questionable. A
ansistor circuit on an adequate heat sink
n probably operate inside the car under
st about any ambient conditions the opera-
r can stand.

It is undeniably true that the future of the
ansistor in amateur radio is limited only by
imagination, ingenuity, and stubbornness
the experimenter. Don't hesitate to look for
bs for them, not just in tried applications, but
typical try-it-and-see fashion. The amateur is
own for his ability to get more from his
uipment than the manufacturer expected. In
early days of the electron tube he found
ys to exceed the ratings and get away with
but he also learned how to get *around*
ings. The transistor is a good case in point.
ltage ratings in transistors, including *tran-*
nts must be respected. So must temperature
ings. And yet in today's transistor power
pplies we are developing output powers of
er a hundred watts, several times what the
me transistor could deliver in audio service.

This is possible by operating the transist only under conditions of minimum heating. this service the transistor switches rapidly fro one extreme to another. It generates minimu heat during a period of no current flow . and then switches rapidly to a condition whe it is conducting a large current, but with su a comparatively low internal resistance that squared R heat generation is at a minimu So far our main effort in transistor circuit d velopment has been in making them do wh tubes or other components once did. This worthwhile, of course, but the real test of t transistor, and the experimenter, is in new a plications.

You may find, as we have, that anodizing so simple that you'll want to use it for oth purposes. Commercial aluminum products a often anodized to give them an extremely ha surface, a condition very desirable in equi ment panels. Many commercial aluminu products are anodized and then dyed in colo

There's no reason why you should have a more trouble in this project than we have ha The voltage, current, and acid mixtures use in our work is little more than an intellige guess. How closely they match with commerci techniques and commercial results is somethi we have not investigating further, for we g satisfactory results with this system. If you ha an easier or better system . . . or have a trouble with this one, let me know. (This tim don't write the editor—write me.)

SATELLITE RECEPTION [*from page 33*]

becomes almost impossible to read. This generally true at least part of the time.

2. The beat oscillator also heterodyne against the sideband components produced b the telemetry frequencies. As these frequencie are rather closely spaced to the carrier fre quency and each other, the result is the gen eration of at least two complete sets of spuriou frequencies plus the original beat frequency all of which are continuously changing from doppler shift and/or receiver instability.

If, in addition to this, harmonic distortio is present within the receiver or tape recorder then to add to the existing woes a second orde collection of intermodulation products appea in the output. The result is similar to the "search for a needle in the haystack" with the needle being periodically moved.

Having rather thoroughly covered the dark side of the picture a few positive thoughts on the subject might be appropriate. A few sug gestions are given to minimize the difficulties that have arisen from the existing recording procedures.

Receiver tuning procedures may be some what different depending upon the type of modulation used in the transmitter. If the be satisfactorily employed even without the use of band separation filters for the various telemetry channels.

ansmitter is frequency modulated, the receiver should be centered on the carrier as in andard tuning procedures, either by using e telemetered signal for tuning or, preferbly, a stable reference oscillator whose freuency calibration is known accurately.

In the case of the amplitude modulated ansmission, two approaches are possible. irst, the receiver may be adjusted such that s bandwidth is sufficient to receive both sets f sidebands with little attenuation. An alernate procedure would be to operate the receiver more or less as a single sideband system ith a bandpass adequate to accept the carrier requency plus one set of sidebands with due llowance for doppler shift. In either case, rystal filter operation of the receiver is inadisable unless the filter rejection peak is well utside the carrier or highest sideband freuency.

If at all possible a crystal reference oscillator s advisable for tuning purposes. No adjustnents whatsoever should be made to the eceiving equipment during a satellite pass vith the possible exception of a quick tuning heck during the maximum signal condition f a good reference oscillator is not available.)ne reason for this is that certain types of lata reading equipment, for instance a wave nalyzer, may be sensitive to changes in the oise spectrum as caused, for example, by eceiver tuning.

In many cases telemetry signals which may ot be at all audible may be translated quite eadily. If the presence of the carrier is inlicated by an increase in the receiver noise, alid telemetering information may be present nd recording should be started at this time. ssuming the receiving system is properly adusted to pass the carrier and sideband comonents, the audible signal-to-noise ratio is etermined by these adjustments. This is not he signal-to-noise ratio, however, as viewed rom the standpoint of an individual telemetry hannel which is much more narrow than that f the receiving system as a whole. As a reult, the signal-to-noise ratio of the individual elemetry channel is improved by a factor equal the total receiver bandwidth divided by the elemetry filter bandwidth. This improvement actor in itself is adequate to make an apaently useless signal easily readable. In adition, it is not difficult to read at least 20 db. elow the noise existing within the filter bandidth by employing a technique no more comlex than an oscilloscope whose vertical input the telemetered signal and whose horizontal nput is an external audio oscillator. The techique, of course, is that of frequency measureent of the sub-carrier oscillator by zeroeating the reference oscillator. The approach both simple and reliable and has been used reading many data tapes. This method may

[Continued on page 193]

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ATELLITE RECEP. [from p. 187]

: satisfactorily employed even without the ie of band separation filters for the various lemetry channels.

The final data interpretation from both ama-ur and professional tape recordings is highly ependent upon an accurate knowledge of the me at which the recordings were made. The gnal strength at each receiving station varies reatly between various satellite passes as well s during a single pass. It is necessary, there-re, to analyze the data from several stations hich may be receiving the signal approximate- at the same time. If the recorded time is not nown for each station, the data may be icomplete, confusing, or even worthless. In eneral, this requirement has been recognized y amateurs who have participated in this rogram.

Various methods of recording time have een used by amateurs. One amateur handled ie problem by switching from telemetered ata to WWV for both the five minute voice nd code announcements with a few seconds reak for each one minute mark. This method, hile excellent, generally requires the use of second receiver. An alternate method that iould be quite good would be the accurate etting of a clock or watch to WWV before ie satellite pass, and voice recording the time or each minute and five minute period. A third ossibility would be the recording of time in ode by either an accurate 400 cycle oscillator the 60 cycle AC line. In either case, the art of the minute would be indicated by a ve to ten second dash following the code nnouncement. The use of either an accurate 00 cycle or 60 cycle frequency has the ad-itional merit of providing a check on the act speed of the recording and reproducing quipment. A worthwhile modification of the bove idea would be to continuously record ie selected tone at a low level and amplitude ey its level for code recording. If possible, ie time error should be held to less than one cond.

The above information is not meant to dis-ourage the efforts of those who have under-ken measurements of the satellite transmis-ons but merely to point out possible improve-ents which might be made in the receiving nd recording of data. This laboratory is well ware of the major contributions which the nateur fraternity has made to science. We ave the greatest respect for their efforts and sults, and fully expect that their contribu-ons to future technology will be equally great.

The author wishes to express his apprecia-on to Messrs. N. W. Mathews of the Naval esearch Laboratory and L. N. Cormier of e National Academy of Sciences for their mments and suggestions on the preparation of is paper. ■

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Void after Nov. 25, 1958

Please send me information on your ads in the November 1958 CQ keyed as follows:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75

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Name________________ Call________________ Engineer ☐
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Address________________ Type of work (specify)________________
City________________ Zone ________ State ________________